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Prevalence of Bovine Trypanosomosis and Vector Density in Alge Sachi District, West Ethiopia

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Abstract: Across-sectional study was conducted from Nov, 2018 to March, 2019 to assess the prevalence of bovine trypanosomosis and apparent density of tsetse flies in four peasant associations of Algesachi district, Illuabbaborzone, Western Ethiopia. The overall 4.17% prevalence of bovine trypanosomosis was recorded from 576 blood sample collected from selected animals using buffy coat method. *Trypanosoma congolense* was the dominant species 17 (70.83%), while the low infection was *Trypanosoma vivax* 7(29.17%). The highest prevalence 12(4.17%) of the disease was recorded in Adare peasant association while the lowest 3(3.2%) was recorded in Mogu and Sanbato association. The mean packed cell volume (PCV) of parasitemic animals was significantly lower (22.5%) than aparasitemic animals (26.96%) ($P<0.05$). Overall an apparent density of the flies was 3.664 f/t/d by using Mono-pyramidal and Biconical traps. It indicated that, *G. fuscipes fuscipes, G. pallidipes* and *G. tachinoides* were tsetse flies species caught. Generally, 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: PCV · Trypanosomosis · Prevalence

INTRODUCTION

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

Trypanosomosis is a 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 livestock 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 livestock 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

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the indirect losses like exclusion of livestock and anima; 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 Alge-Sachi district the magnitude of trypanosome infection and the distribution of its vectors are not well known except complaints from farmers of the area.

Therefore, the objective of the study was

- To determine the prevalence of bovine trypanosomosis
- To identify vector species and their apparent density
- To assess the risk factors associated with the disease and collecting baseline data to control the vectors.

MATERIALS AND METHODS

Study Area: The study area is located in Oromia regional state, Illiabbabor zone and lies at 035°64 to 035°72E longitudes and 08°48 to 08°68 latitude and north of equator. Altitude of the area ranges from 500 to 1800 m.a.s.l. The climatology alternates with long summer rain fall (June- Sep), short rainy seasons (March-April) and winter dry seasons (December-February). The district has 32°C maximum temperature and 15°C minimum temperature and 1000 mm to 1800 mm rain fall. The study was conducted in 4 peasant associations (PAs), namely Adare, Mogu, Wayu and Sanbato. There are river basins which flow throughout the year from the district to Gabba River system, namely Meti River and Danbi River other seasonal rivers which are tributers of Gabba and Meti Rivers are also found. The different vegetation type which are found in the district, include *Combratum* spp*, Pilliostigama thonningi, Acacia* spp and *Ficus sycomors*. Wild games like buffalos, Bush pig, Kudu, warthog, hippo and crocodiles are the most commonly found in the study area. Agriculture is the main stay of livelihood of people with a mixed farming system and livestock plays an integral role for agriculture [7].

Study Animals: The cattle in the district are local breeds that are kept under traditional extensive husbandry systems with communal herding. Agriculture is the main livelihood of the society with mixed farming system and livestock play an integral role for agriculture. The district has 18 peasant associations and animal population estimated to be 122,985 cattle, 10,540 sheep, 16,933 goats and 1,203 eqiune. The study was conducted on 576 local breed cattle selected from seven peasant associations in the district. Of these animals, 288, 94, 96 and 98 were from Adare, Mogu, Sanbato and Wayyurespectively. The origin, sex, age and body condition score of the animals were explanatory variables used to associate with prevalence rate.

Study Design: Cross-sectional study was conducted to determine the prevalence of bovine trypanosomosis and apparent density of vectors (tsetse population).

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 [8].

Study Methods

Entomological Survey: For the entomological study, tsetse flies and other flies were collected from selected sites of the study area. The altitude levels, Peasant Associations, numbers of traps, tsetse species caught, other biting flies, days and vegetation types were recorded during the sampling period. The flies were caught with traps baited with acetone, octenol and cow urine. In the selected sites of the study area, about 60 baited traps were deployed at 200-250 meters interval at side of river and woody grass land and kept in position for 48 hours. During trapping, acetone and octenol was dispensed from open vials through an approximately, 'O'- sized hole while cow urine from open bottles into which a quarter of tissue paper was used. All odors were placed on the ground about 30 cm upwind of the trap. The underneath of each pole was smeared with grease in order to prevent the ants climbing up the pole towards the collecting cage that could damage the tsetse flies. The different fly catches in each trap were counted and identified; the species of tsetse flies and other biting flies were identified based on their morphological characteristics such as size, color and wing venation structure [9].

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 [10].

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 bellow 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 x 40 objective x10 eye piece for the movement of the parasites [11, 12].

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. For the analysis of data statistical software program (SPSS 20.0) was used. 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 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: A total of 291 tsetse flies were caught during study period. The overall apparent density of tsetse flies was 2.08 f/t/d. Three tsetse species have been identified. 110 (37.80%) were *Glossina fucipes fuscipes,* 105(36.08%) were *Glossina pallidipes* and 76(26.11%) were *Glossina tachinoides*. From overall the study sites, the lowest (1.62 f/t/d) in Adare peasant associations. From total tsetse flies trapped females occupied larger proportion and out of 291 tsetse flies caught, 205(70.45%) flies were female while the rest 86(29.55%) were male (Table 1).

Parasitological Findings: The overall prevalence of bovine trypanosomosis in the study area was 4.17%. The prevalence of bovine trypanosomosis in each peasant association was determined to be 6.12% in Wayyu, 4.17% in Adare, 3.2% in Mogu and 3.12% in Sanbato. Among those four peasant associations, wayyu peasant association showed the highest prevalence rate (6.12%) as shown in (Table 2). *T. congolence* was dominant species with a proportion of 17 (70.83%), followed by *T. vivax* infection 7(29.17%).

Table 1: Apparent density of flies in different PA's in Alge sachidistrict.

		G. pallidipes		*G. tachinoides*		*G. f. fuscipes*			
Pas	No of trap deployed	M	F	M	F	M	F	Total	FTD
Wayyu	15	14	20	2	17	5	17	75	2.5
Mogu	15	8	15	5	21	7	15	71	2.37
Sanbato	15	7	11	1	12	10	23	64	2.13
Adare	25	13	17	3	15	11	22	81	1.62
Total	70	42	63	11	65	33	77	291	2.08

Pas: Peasant associations, FTD: Fly per trap per day, F: female, M: male

Table 2: Overall prevalence of bovine trypanosomosis in different PA's of Algesachi district.

			Trypanosome spp.		
Peasant association	Number of animal examined	Infected animals	T.c	T.v	Prevalence (%)
Wayyu	98	6	3	3	6.12
Mogu	94	3	1	2	3.2
Sanbato	96	3	2	1	3.12
Adare	288	12	11	1	4.17
Total	576	24	17	7	4.17

T.c: *Trypanosoma congolense*, T.v: *Trypanosoma vivax*

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

Group	Observations	Mean PCV	SE	SD	95% CI
Negative	552	26.96	0.23	5.52	26.49---27.42
Positive	24	22.5	0.78	3.82	20.88--- 24.11
Total	576	26.77	0.23	5.53	26.32---27.22

SD= Standard Deviation, SE= Standard Error, PCV=Packed cell volume

There was statistically significant difference (P<0.05) in prevalence of infection between body condition score. 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 0.94, 2.4 and 8.94%, respectively.

Hematological Findings: The mean PCV values of studied animals was significantly (p<0.05) parasitemic (22.5± 3.82%) and aparasitaemic (26.96 ± 5.52%) t=0.00, DF=574 (Table 3).

DISCUSSION

The present study revealed that from a total of 576 randomly selected cattle's in the study area, 24 (4.17%) of the animal were positive for trypanosomes. This finding was lower than the previously reported infection rate of 18.5% in Arba-minchzuria district [13], 11.7% in Abay Basin northwestern Ethiopia [14], 20.4% in Wolyta and Dawero Zone of Southern Ethiopia [15], 16.9% in Sayo, district, kellemWollega, Western Ethiopia [16] and 29% prevalence in Gawo-Dale, West Oromia [17]. The lower prevalence in the current study might due to the 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.

This study shows that, *T. congolence* was dominant species with a proportion of 17(70.83%), followed by *T. vivax* 7(29.17%). These results agreement with the predominance of *T. congolense* infection in cattle as compared to *T. vivax* and may be due to the development of better immune response to *T. vivax* by infected animal. Moreover, the most prevalent trypanosome species in tsetse infested area of Ethiopia are *T. congolense* [18].

During the study period, the prevalence of bovine trypanosomosis in their different body condition scores (good, medium and poor) animals shows that statistically significant difference (P<0.05). The prevalence of trypanosomosis in those animals with poor body condition (8.94%) was higher than those in medium (2.4%) and good (0.94%) body condition. Similar findings were reported in Abay (Blue Nile) base areas of Northwestern, Ethiopia [19] in Bure district, western Ethiopia [20]. On another hand disagreement with the study in Metekel and Awi zone of North West Ethiopia [21]. Obviously, the disease itself result in progressive emaciation of infected animals; never less, non-infected animals under good condition have well developed better immune status that can respond to any foreign protein better than those non infected cattle with poor body condition which can be immune compromised due to other disease or malnutrition, since malnutrition and concurrent infections depress the immune responsiveness in some cases [22].

In this study, the occurrence of the disease between the sex of animals, shows that no statistical significance (P>0.05) variation.

The present study indicated that the difference between mean PCV values of parasitaemic (22.5%) and aparasitaemic (26.96%) cattle of the study area was significant (P<0.05). This result was in agreement with the previous work done in BiloNophadistrict, south west Ethiopia [23, 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 in 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 aneamic situation after current treatment with trypanocidal drugs or due to be anaemic by other complicative cause like malnutrition. Parasitaemic animals with PCV values greater than 25% might be thought of recent infection. Trypanosome infection and mean PCV 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].

The risk of trypanosomosis is also influenced by apparent density of the tsetse flies and type of vector prevailing in the area. In this study, the entomological findings revealed that three species of *G. pallidipes*, *G. tachinoides* and *G. fuscipes fuscipes*) out of five reported in Ethiopia. The overall apparent density of *Glossina* species was 2.08 flies/ trap/ day. These findings lower than the previous report 11.9 f/t/d from Hewa-Gelan district, Oromia region, west Ethiopia [29], 4.3 f/t/d/ from Lalo-Kiledistrict, Kellem Wollega Zone, Western Ethiopia [30]. The result also higher than the previous report 1.15f/t/d for tsetse in East Wollega zone [31] and 1.35 f/t/d in southern rift valley of Ethiopia [32]. Higher percentage of female (70.45%) tsetse flies was caught than males (29.55%) that are in line with various reports from different parts of Ethiopia [33, 34]. This could be adhered to longer life span of female tsetse flies than males [35-37].

CONCLUSION

The present study indicated that trypanosomosis is one of the most important constraints for livestock production in the area. Thus, strategic control of bovine trypanosomosis including integrated and sustainable vector control should be strengthened to improve livestock production and agriculture development in the area.

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