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Bovine Trypanosomosis in Dano District, West Shoa Zone West Ethiopia

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Abstract: Across-sectional study was conducted from January to May, 2018 to assess the prevalence of bovine trypanosomosis in four peasant associations of Dano district, West Shoa zone, Western Ethiopia. The overall 4.14% prevalence of bovine trypanosomosis was recorded from 411 blood sample collected from randomly selected animals using Buffy coat method. *Trypanosoma congolense* was the dominant species 12 (70.59%), while the low infection was 3(17.63%) and 2(11.76) T. *vivax* and mixed infection, respectively. The highest prevalence 7(6.30%) of the disease was recorded in Ajila Dale peasant association while the lowest 1(1.10%) was recorded in Sayyo Gambella association. The mean packed cell volume (PCV) of parasitemic animals was significantly lower (22.82%) than aparasitemic animals (27.12%) ($P<0.05$). Overall an apparent density of the flies was 1.9 f/t/d by using Monopyramidal and Biconical. It indicated that, G. fuscipes fuscipes and G. pallidipes 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 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 Dano 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

MATERIALS AND METHODS

Study Area: The study area is located in Oromia regional state, Western Shoa. Altitude of the area ranges from 500 to 1800 m.a.s.l. he 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 1000mm to 1800mm Rain fall. The study was conducted in 4 peasant associations (PAs), namely Ajila Dale, Awadi Gulufa, Oda Liben and Sayyo Gambella. There are river basins which flow throughout the year from the district to Gibe River system. The different vegetation type which are found in the district, include *Combratum spp, Pillistigamathonningi, Acacia spp* and *Ficassycomors*. 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 animals used for this study were all age, body condition and non-select of sex of local zebu cattle, which are usually kept under an extensive husbandry system. Agriculture is the main livelihood of the society with mixed farming system and livestock play an integral role for agriculture.

Study Design: Cross-sectional study was conducted to determine the prevalence of bovine trypanosomosis and 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 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 x40 objective x10eye piece for the movement of the parasites [11, 12].

Data Management and Analysis: The prevalence wascalculated 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 247 tsetse flieswere caught during study period. The overall apparent density of tsetse flies was 1.9 f/t/d. Two tsetse species have been identified. 127(51.42%) were Glossina fucipes fuscipesand 120(48.58%) were Glossinapallidipes. From overall the study sites, the highest (4.02 f/t/d) in Ajila-Dale peasant associations. From total tsetse flies trapped females occupied larger proportion and out of 247 tsetse flies caught, 195(78.95%) flies were female while the rest 52(21.05%) were male (Table 1).

Parasitological Findings: Out of 411 cattle examined 17 (4.14%) were found to be infected with trypanosomes. The prevalence of Trypanosomosis was significantly high in Ajila Dale followed by that of Awadi Gulufa and Oda Liben. The highest prevalence on the basis of species was *T. congulence* followed by *T. vivax* and Mixed (Table 2).

Risk Factor Variable: The prevalence of trypanosomosis was higher in males as compared to female animals. However, the difference was not statistically significant ($P > 0.05$). The prevalence of trypanosomosis between body condition scores was highest in poor and it was statistically significant ($P < 0.05$).

Packed Cell Volume (PCV): The mean PCV values of studied animals was statistically significant ($p<0.05$) parasitemic ($22.82 \pm 3.18\%$) and aparasitaemic ($27 \pm 3.61\%$) $t = 0.00$, $DF = 409$ (Table 3).

DISCUSSION

The present study revealed that from a total of 411 randomly selected cattle's in the study area, 11 (4.14%) 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.

Out of the 4.14% overall prevalence of trypanosome infection, 2.91% were due to *T. congolense* and 0.73% and 0.49 were due to *T. vivax* and mixed respectively. The finding of this study showed that of the total trypanosome positive animals 70.59% were found to be infected with *T. congolense* and 17.65% and 11.76% were infected with *T. vivax* and mixed respectively. The higher proportion of *T. congolense* in this study was in agreement with the previous results of Abebe and Jobre [18] with finding of (66.1%). Moreover, the results of Duguma *et al.* [19] (85.2%) and Rowland *et al.* [20] in Ghibe valley, Southwest Ethiopia (84%), had also shown higher results of *T. congolense*.

The predominance of *T. congolense* infection in cattle suggests that the major cyclical vectors or Glossina species are more efficient transmitters of *T. congolense* than *T. viva*x in East Africa [21] and also due to the high number of serodems of *T. congolense* as compared to *T. vivax* and the development of better immune response to *T. vvax* by infected animals. Different studies [22] have indicated that *T. vivax* is highly susceptible to treatment while the problems of drug resistance are higher in *T. congolense* and *T. congolense* is mainly confirmed in the blood, while *T. vivax* and *T. brucei* also invade the tissues. *T. congolense* and *T. vivax* are the most prevalent trypanosomes that infect cattle in tsetse infested and tsetse free areas of the Ethiopia, respectively [23].

The prevalence of Trypanosomosis under different body condition groups indicated statistically significant difference with higher infection rate in poor body conditioned than medium and good body conditioned cattle. Similar findings were reported in Abay (Blue Nile) base areas of Northwestern, Ethiopia [24] in Bure district, western Ethiopia [25]. On another hand disagreement with the study in Metekel and Awi zone of North West Ethiopia [26]. The less infection in the good body condition animals might be related to that well-nourished animals have good level of immunity and are in a better position to resist infection, moreover there is a very rare possibility to resist infection, moreover there is a very rare possibility condition [27].

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

Table 1: The Mean catch of fly species in Dano District

			Glossina species caught								
			Gloss pallidippes		Glossina Fuscippes				Other biting flies		
No. of sites (PAs)	PA's with site of trap deployed	No. of traps deployed	M	F	M	F	Total	FTD	Stomoxy	Tabanus	Haematopota
1	Sayo Gambella (Ghibe Upper & down)	30	0	0	0		0		17	5	
2	Oda Liben (Ghibe river)	18	11	39	10	50	110	3.05	11	7	
3	Ajila Dale (Ghibe and Bilbila river)	17	16	54	15	52	137	4.02	8	4	
	Total	65	27	93	25	102	247	1.9	36	16	

Table 2: The prevalence of trypanosomosis in different Peasant association with respective species

			Trypanosoma spp.			
Peasant association	Number of animal examined	Number of Infected animals	*T. congolense*	*T. vivax*	Mixed	Prevalence (%)
Ajila Dale	118	7	5	2	-	6.30
Awadi Gulufa	107	6	4	1	1	5.94
Oda Liben	94	3	2	-	1	3.30
Sayyo Gambella	92	1	1	-	-	1.10
Total	411	17	12(70.59%)	3(17.65%)	2(11.76)	4.14%

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

Group	Observations	Mean PCV	SE	SD	95% CI
Negative	394	27.12	0.18	3.61	26.77---27.48
Positive	17	22.82	0.77	3.18	21.18--- 24.46
Total	411	26.95	0.18	3.69	26.59---27.30

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

The present study indicated that the difference between mean PCV values of parasitaemic (20.65%) and aparasitaemic (25.74%) cattle of the study area was significant (P<0.05). This result was in agreement with the previous work done in Bilo Nopha district, south west Ethiopia [28] and three highland districts bordering Lake Tana, Ethiopia [29]. Being intracellular blood parasites, trypanosomes result in lowering PCV of cattle because they lyse 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 [30, 31] 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 [32, 33].

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 two species of *Glossina* (*Glossinapallidipes* and *G. fucipes fuscipes*) out of five reported in Ethiopia. The overall apparent density of *Glossina* species was 1.9 flies/ trap/ day. These findings lower than the previous report 11.9 f/t/d from Hewa-Gelan district, Oromia region, west Ethiopia [34], 4.3 f/t/d/ from Lalo-Kiledistrict, KellemWollega Zone, Western Ethiopia [35]. The result also higher than the previous report 1.15f/t/d for tsetse in East Wollega zone [36] and 1.35 f/t/d in southern rift valley of Ethiopia [37]. Higher percentage of female [78.95%] tsetse flies was caught than males [21.05%] that are in line with various reports from different parts of Ethiopia [38, 39]. This could be adhered to longer lifespan of female tsetse flies than males [40, 41, 42].

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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