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Prevalence of bovine trypanosomosis and apparent density of tsetse flies in Hawa Gelan district, West Oromia, Ethiopia

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Abstract
Across sectional study was conducted from October to November 2021 to determine the prevalence of bovine trypanosomosis and the apparent density of tsetse flies in six peasant association of hawa gelan district. For the prevalence study, dark phase contrast buffy coat examination and giemsa stained thin blood smears were used. Whereas for entomological survey to determine apparent density of flies, traps were deployed. The entomological survey indicated that four species of glossina were the fly species caught in the study area. Apparent tsetse flies density of 5.34 flies/trap/day was recorded in the district and the highest FTD was recorded Mender 16 village. For the prevalence study, out of total of 532 cattle examined, 19(3.57%) were found infected with trypanosomes. Out of infected animals highest prevalence was recorded in cattle with poor body condition (52.63%) followed by medium (31.58%) and good (15.79%).The overall mean PCV value of examined cattle is 29.29± 4.813 and the overall mean PCV value of non infected cattle was slightly higher (29.30%) than that of infected animals (28.3%).Among the species of trypanosomes isolated, Trypanosoma vivax was identified to the major causes of trypanosomosis in the study area accounting for 63.16% of total infections observed followed by trpanosoma congolense (36.84%) respectively. Taken as a whole, the present work evidenced that tsetse and trypanosomosis has continued to pose aconsiderable threat to cattle of the study area warranting an integrated control to safeguard cattle production and productivity.

Keywords: Bovine trypanosomosis, prevalence, tsetse fly, hawa gelan

Introduction
Trypanosomosis is a complex disease caused by unicellular parasites found in the blood and other tissues of vertebrates including livestock, wild life and people. The most important trypanosome species affecting livestock in Ethiopia are Trypanosoma congolense, Trypanosoma vivax, and Trypanosoma brucei in cattle, sheep and goats, Trypanosoma evansi in camels and Trypanosoma equiperdium in horses (1 Abebe G).
The influence of tsetse on African agriculture through the transmission of trypanosomosis continues to be a major constraint to the development of national economies and their achievement of self-sufficiency in basic food production. The general distribution of tsetse flies is determined principally by climate and influenced by altitude, vegetation, and presence of suitable host animals (4 Leak SG (1999) [4]. Tsetse flies in Ethiopia are confined to southern and western regions between longitude 33 0 and 380 East and latitude 50 and 120 North which amounts to about 200,000 Km2. Tsetse infested areas lied in the low lands and also in the river valleys of Blue Nile, Baro Akobo, Didessa, Ghibe and Omo. Out of the nine regions of Ethiopia five (Amhara, Beninshangul Gumuz, Gambella, Oromia and Southern Nation Nationalities and peoples) are infested with more than one species of tsetse flies. To date five species of Glossina (Glossina morsitans submorsitans, G. Pallidipes, G. tachnoides, G. f. fuscipes and G. longipennis) have been recorded from Ethiopia. Apart from the cyclical transmission of trypanosomosis by the Glossina species, it is highly considered that mechanical transmission is a potential threat to livestock productivity in some parts of Ethiopia (Abebe G 1). In dale sadi district trypanosomosis was found to be one of the factors that hampered livestock rearing in most peasant associations. Therefore, a study on the status of the disease and investigating the vectors and their relative abundance is crucial for a successful control in the area. Therefore, the present work aimed at determining the

prevalence of bovine trypanosomosis and apparent density of tsetse and other biting flies ascribed in the transmission of trypanosomosis.

2. Materials and Methods

2.1. Descriptions of Study area

The study was conducted from October to November 2021 in Hawa Gelan district located in kelem Wollega zone of Oromia regional sate, situated at 570 Kilometers West of Addis Ababa. The mean annual rain fall in Hawa gelan district ranges from 1150-1300mm. The annual temperature ranges from 26.1-34 °C. The district has altitudes ranging from 1200-2000 M.A. S.1. The district has large rivers conducive for tsetse fly habitat like birbir river, Mojo River. The areas have got a number of wild animals such as African buffaloes, Bush pigs, warthog, bush buck, kudu, hippopotamus, crocodiles, hyena, antelopes and snakes wwmedmed to serve as sources of of eded farming system and livestock play an integral role for agriculture (HGADO.2021) [2].

The animal population of the district is estimated to be 85,189 cattle, 28,600 sheep, 19,699 goats, 181 horses, 470 mules, and 3839 donkeys (HGLDFO. 2021) [3]

2.2. Sample size determination

Sample size was determined using 95% confidence level, 50% expected prevalence and 0.05 desired absolute precision using the formula described by Thrustfield (2005). Therefore, a total of 384 cattle were needed for the study. However, sample was collected from 532 animals to increase precision.

2.3. Study Design and protocol

A cross-sectional study design was employed. For the trypanosomosis prevalence study, dark phase contrast buffy coat examination and Giemsa stained thin blood smears were used. Blood sample collection was performed by piercing the marginal ear vein with a sterile lancet and blood was drawn by a heparinized capillary tube. Then one end (the heparanized end) of capillary rubes were sealed with crystal sealant and centrifuged at 12,000 rpm for five minutes to separate the blood cells and to concentrate trypanosomes using centrifugal forces, as buffy coat. Then the PCV was determined and recorded. The capillary tubes were then broken just below buffy coat using diamond pencil and expressed on microscopic slide and covered with a cover slip. Then it was examined under 40× objective of microscope to detect the presence of the parasites. Trypanosome species were identified using Giemsa stained thin blood films. For the entomological survey, a total of 66 baited traps were deployed along suitable tsetse habitats to assess the apparent densities, distributions and species of tsetse flies and other biting files involving in transmission of trypanosomosis. All traps were baited with acetone, Octenol (1-3-Octane) and cow urine filled in separated bottles and labeled and deployed at an interval of 100-150 meters. The coordination and altitude of each trap were recorded using GPS. The vegetation type, the prominent feature within 100 m radius and the canopy of each trap were recorded. After 48 hours of trap deployment, the cages were collected and captured flies were identified and sexed according to morphological characteristics and counted. The tsetse flies were identified to species level.

2.4 Data management and analysis

Raw data were entered into a Microsoft Excel spreadsheet and descriptive statistics were used to summarize the data. The prevalence was calculated for all data as the number of infected individuals divided by the number of individuals examined and multiplied by 100. The density of fly population was calculated by dividing the number of files caught by the number of traps deployed and the number of days of deployment and expressed as fly /trap/ day (FTD). The PCV of sampled animals was measured using PCV reader and the result between infected and non-infected animals was compared.

3. Results

3.1 Entomological survey result

A total of 66 mono-pyramidal, bi-conical, mono-conical and NGU traps were deployed in the district. The apparent density of tsetse flies is 5.34 fly/trap/day. Savana and riverine species of Glossina particularly pallidepes 17.28%, *G. Morsistance* submorsistance 29.75%, *G. Furcipes* 28.19% and *G. Tachinoides* 24.79% were caught from the district. Out of total caught tsetse flies, 25.35% were male and 74.65% were female (Table 1). The highest FTD was recorded in Chamo villages from the study areas (Table 2).

Table 1: Relative abundance of Glossina in study areas

PA's	No of traps	Overall all testes	Glosina species				
			GM	GP	GT	GF	FTD
Mendar 16	11						2.54
Mender 15	11						7.18
Mender 20	11						21.18
Mender 10	11						0.35
Mender 9	11						0.54
Bikiltu mechara	11						0.40
Total	66						5.34

Table 2: Proportion of male and female Glossina species in the study area

PA's	Total number testes	Male	Female
		Number (%)	Number (%)
Mender 16			
Mender 15			
Mender 20			
Mender 10			
Mender 9			
Bikiltu mechara			
Total			

S. No	Glossina species	Sex				Total	Total prevalence by %
		Male	Prevalence by %	Female	Prevalence by %		
1	G. Morsistance submorsistance	44	20.95	166	79.05	210	29.75
2	G. Pallidepes	25	20.49	97	79.51	122	17.28
3	G. Furcipes	55	27.64	144	72.36	199	28.19
4	G. Tachinoides	55	31.43	120	68.57	175	24.79
Total		179	25.35	527	74.65	706	100

3.2 Trypanosomes survey results

A total of 532 cattle were examined. The overall prevalence of trypanosomosis was 3.57%. The prevalence of trypanosomosis was determined to be 3.48% (3/86), 3.0% (4/100), 2% (5/74), 2% (2/100), 4.16% (3/72) and 2% (2/100) in Awetu Gandaso, Awetu Birbir, Chamo, Arere Chole, Lalo kera and Oguyo Jaro villages respectively (Table 2). Out of the parasitaemic cattle 36.84% were infected with T. Congolense and 63.16% were infected with T. Vivax. Therefore, T. Vivax is considered as the dominant species responsible for infection of cattle residing in the district. Highest prevalence was recorded in cattle with poor body condition (52.63 %) followed by medium (31.58%) and good (15.79%) out of the parasitaemic cattle. Highest infection rate was recorded in Adult (52.63%) cattle followed by old (26.32%) and young (21.05%). The prevalence in female animals (57.89%) was higher than in males. (Table 1)

Analysis of Risk factors with prevalence of trypanosomosis

Risk factors	Risk category	Number examined	Number positive	Prevalence
Origin of animals	Mender 16	86	3	3.48
	Mender 15	100	4	3
	Mender 20	74	5	6.75
	Mender 10	100	2	2
	Mender 9	72	3	4.16
	Bikiltu mechara	100	2	2
	Total	532	19	3.57

Table 3: Prevalence of trypanosomosis in relation with sex, age, and body condition of infected animal.

	Sex			Age				Body condition			
	M	F	Total	Young	Adult	Old	Total	Poor	Medium	Good	Total
Infected animals	8	11	19	4	10	5	19	10	6	3	19
Prevalence	42	57.9	100	21	52.63	26.3	100	52.6	31.58	15.8	100

Table 4: Trypanosomes survey results

SN	Villages	Trap deployed	FTD	No. of animals examined	Positive animals	Prevalence
1	Mender 16	11	2.54	86	3	3.48
2	Mender 15	11	7.18	100	4	3
3	Mender 20	11	21.18	74	5	6.75
4	Mender 9	11	0.35	100	2	2
5	Mender 10	11	0.54	72	3	4.16
6	Bikiltu mechara	11	0.40	100	2	2
Total		66	5.34	532	19	3.57

3.3 Hematological survey result

The overall mean PCV value of examined cattle was 29.29 ± 4.813. The mean PCV of non-infected cattle was slightly higher (29.30%) than that of infected animals (28.3%). In fact the difference in mean PCV between parasitaemic animals and aparasitaemic animals indicated that trypanosomosis may be involved in adversely lowering the PCV values of infected animals.

Unavailable Logistic regression analysis of anemic and normal cattles.

Category	Number of examined	Number positive	Proportion	Mean PCV
Anemic (<24)	50	13		23.75
Normal (>24)	44	6		28.70
Total				29.29

Category	Number positive	Proportion	Mean PCV
Parasitemic	19		24.25
Appasitemic	513		28
Total	532		

4. Discussion

In the present study, the apparent density of tsetse flies caught was 5.34 fly/trap/day in hawa gelan district. G. Morsistance submorsistance, G. Pallidipes, G. furcipes and G. Tachinoides were the species recorded. The current result is lower than what was reported from the same study area (9.8%) and Dale Wabera (9.1%) by Bedaso (19) and Senbata (20) from Hawa Gelan district. The number of traps deployed, site of trap installation, the months of study etc. could contribute for the variation (21). The fly species identified also agrees with the reports of Terefe (22) and Senbata (20). The low apparent density of tsetse fly by this study may be attributed to application of tsetse control measures such as target impregnated insecticides and insecticide treatment of cattle.

The survey revealed that the overall trypanosome prevalence was 3.57%. This result is consistent with the work reported in Esitsa (3.45%). The current prevalence of trypanosomosis in the woreda was lower than previous result of the same study area reported by Bedaso (6.7%). The lower prevalence of trpanosomosis in this study may be attributed to application of control measures such as target impregnated insecticides, insecticides treatment of cattle and regular treatment of sick animals (2012)). The highest prevalence was reported in mender 20 village (6.75) and the lowest was in Mender 10 (2%) and Bikiltu mechara (2%). The Prevalence among districts and Peasant associations in this study could be attributed to the tsetse fly type present in each peasant association which is dependent on micro climate, animal heard density, distance between herds and other various factors [20]. Finding of this study is lower than which reported 6.3% in Wolaita zone of Kindo Koish district, Southern Ehiopia; Degneh *et al*. [10] reported 6.86% in Lalo Kile district of Oromia regional state; Alamayew *et al*. [2012] [11] which reported 6.9% in Chena district, south west Ethiopia and Denbarga *et al*. [2012] [12], Zecharias and Zeryehun [2012] [15] (27%) in Arbaminch; Begna *et al*. [2011] [7] (14.2%) in Humbo district, southern Ethiopia; Melaku and Abebe [2012] [17] (10.67%) in Debre Elias district, North west Ethiopia; Dagnachew *et al*. 2011 [18] (11.33%) in Jawi district of Amhara region, and

Achukwi and Musongong [2009] [19] which reported (14.3%) in Faro division, northern Cameroon. However, findings of this work is higher than the result reported by Hunde *et al*. [2012] [13] (1.02%) in West Gojam, Ethiopia; and Tadesse *et al*. 2012 [14] (2.66%) in Tselemti Woreda, Western Tigray, and The lower prevalence of trypanosomosis in this study may be attributed to application of control measures such as target impregnated insecticides, insecticide treatment of cattle and regular treatment of cattle. The proportion of Trypanosoma vivax in all sites of this study was higher (63.16%) followed by T. congolense (36.84%). This result is consistent with the report by Cherenet [2004] [21] and Cherenet *et al*. [2004) [22] in tsetse free areas of Amhara region. This result disagreed with the report by Abebe and Jobere 1996 in which they reported 58% of the total trypanosomes detected were T. congolense. Zecharias and Zeryehun (2012) [15] in Arbaminch and Mulaw *et al*. (2011) [7] also reported higher proportion of T. congolense than T. vivax. Such difference could possibly be attributed to the presence of major mechanical vectors and more efficient transmitters of T. vivax. In this study, out of infected animals,age-wise comparison revealed that a highest infection rate was recorded in Adult ones (52.63%). These results agree with that of Tasew and Duguma [2012)] [25] and Dagnachew *et al*. [20121]. Out of trypanosomosis infectedanimals higher prevalence is recorded in poor body conditioned animals (52.63%) than other groups. This finding is similar to the report by Bacha *et al*. [2013] [26]. The prevalence of infection between sex categories was 42.1% for male and 57.89% for females. Similarly, Daya and Abebe [2008] [27] and Teka *et al*. [2012)] [7] also reported the same trend in susceptibility between the two sexes. This shows that both male and female cattle were more or less equally susceptible to trypanosomosis infection.

The overall mean PCV value of examined cattle was 29.29 ± 4.813. The mean PCV of non-infected cattle was slightly higher (29.30%) than that of infected animals (28.3%). In fact the difference in mean PCV between parasitaemic animals and aparasitaemic animals indicated that trypanosomosis may be involved in adversely lowering the PCV values of infected animals. Parasitaemic animals had generally lower mean PCV than the corresponding aparasitaemic ones, though there is appearing of parasitological negative animals within the PCV values of less than the threshold value. This may be due to in adequacy of detection method [Murray 1977] [6] or delayed recovery of anemic situation after current treatment with trypanocidal drugs and may be other blood parasites infection, malnutrition associated with long draught in the areas. While the occurrences of positive animals with PCV greater than 25% might be thought of recent infection of animals.

5. Conclusion

The present work showed a relatively low prevalence of trypanosomosis and apparent density of tsetse flies in Hawa gelan district. However, this is an evidence not to be neglected that tsetse and trypanosomosis has yet continued to pose a considerable threat to cattle of the study area warranting an integrated parasite and vector control to safeguard cattle production and productivity.

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