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Prevalence of Bovine Trypanosomosis and Apparent Density of Tsetse and Other Biting Flies in Mandura District, Northwest Ethiopia

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Abstract

A cross-sectional study was conducted from May to June 2014 to determine the prevalence of bovine trypanosomosis and the apparent density of tsetse and other biting flies in four peasant associations of Mandura district. For the prevalence study, dark phase contrast buffy coat examination and Giemsa stained thin blood smears were used. Whereas for the entomological survey and apparent density of flies, traps were deployed. The entomological survey indicated that *Glossina tachnoides* was the only tsetse fly species caught in the study area along with other biting flies like *Haematopota*, *Stomoxys* and *Tabanus*. Apparent tsetse flies density of 0.06 flies/trap/day was recorded in the district. For the prevalence study, out of a total of 405 cattle examined, 22 (5.43%) were found infected with trypanosomes. Highest prevalence was recorded in cattle with poor body condition (7.06%) followed by medium (5.20%) and god (3.92%). This study showed no significant difference (P>0.05) in trypanosomosis infection rate among peasant associations, age, body condition and sex of the animal. The overall mean PCV value of examined cattle is 29.29 ± 4.813 (|t|=122.49; df=404; *P*=0.00). The mean PCV of non infected cattle was slightly higher (29.30%) than that of infected animals (29.27%). Among the species of trypanosomes isolated, *Trypanosoma vivax* was identified to be the major causes of trypanosomosis in the study area accounting for 81.82% of the total infections observed followed by *Trypanosoma congolense* (18.18%). Taken as a whole, the present work evidenced that tsetse and trypanosomosis has continued to pose a considerable threat to cattle of the study area warranting an integrated control to safeguard cattle production and productivity.

Keywords: Bovine trypanosomosis; Prevalence; Tsetse fly; Mandura

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].

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 [2]. Tsetse flies in Ethiopia are confined to southern and western regions between longitude 33 ^{0} and 38^0 East and latitude 5^0 and 12^0 North which amounts to about 200,000 Km$^{2.}$ 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 [3]. To date five species of *Glossina* (*Glossina morsitans submorsitans, G. Pallidipes, G. tachnoides, G. f. fuscipes* and *G. longipennis*) have been recorded from Ethiopia [3]. 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 [1].

In Mandura 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.

Materials and Methods

Study area and period

The study was conducted from May to June 2014 in Mandura district located in Metekel zone of Benishangul Gumuz regional sate, situated at 547 Kilometers North West of Addis Ababa. The mean annual rain fall in Mandura district ranges from 900- 1400 mm. The annual temperature ranges from 28-30^{o}C. The district has altitudes ranging from 1000-1400 m. a. s.l. The district is located in Blue Nile valley. The areas have got a number of wild animals, such as African buffaloes, Bush pigs, warthog, bush buck, kudu, hippopotamus, crocodiles, hyena, antelopes and snakeswhich are claimed to serve as sources of food for the fly as reservoir for trypanosomes.

Study population

The cattle in the district are local breeds that are kept under

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traditional extensive husbandry systems with communal herding. Agriculture is the main stay of the livelihood of the society with mixed farming system and livestock play an integral role for agriculture. The animal population of the district is estimated to be 22,985 cattle, 10,540 sheep, 16,933 goats, 23 mules, and 1,203 donkeys in 2012.

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 405 animals to increase precision.

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 [4]. Trypanosome species were identified using Giemsa stained thin blood films. For the entomological survey, a total of 57 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 200-250 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 and the other biting flies to the genus level.

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 association between the prevalence of trypanosome infection and 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. All statistical analyses were conducted using SPSS version 20.0 software. 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 files 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 57 mono-pyramidal, bi-conical, mono-conical and NGU traps were deployed in the district (Table 1). As indicated in Table 1, the apparent density of tsetse flies is 0.06 fly/trap/day. Few riverine species particularly *Glossina tachnoides* was caught from the district. Out of total caught tsetse flies, 28.57% were male and 71.43% were female. Other biting flies including *Stomoxys* (52), *Tabanus* (12) and *Haematopota* (519) species were also caught. The apparent density of *Tabanus*, *Haematopota* and *Stomoxys* were 0.11, 4.55 and 0. 46 f/t/d respectively. Large number of *Musca* Species were also caught but discarded because they have no role in the transmission of trypanosomosis.

Trypanosomes survey results

A total of 405 cattle were examined. The overall prevalence of trypanosomosis was 5.43%. The prevalence of trypanosomosis was determined to be 4.39% (5/114), 5.74% (10/174), 6.82% (6/88) and 3.45% (1/28) in Dihanzibaguna, Edida kutir 2, Ejenta and Esitsa villages respectively (Table 2). 18.18% of the parasitaemic cattle were infected with *T. congolense* and 81.82% 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 (7.06%) followed by medium (5.20%) and good (3.92%). But no significant difference was observed between animals of different body conditions ($p=0.71$; $\chi^2=0.69$). Highest infection rate was recorded in young (7.59%) cattle followed by old (6.06%) and adult (4.41%), but no significant difference was observed ($p=0.53$; $\chi^2=1.26$). The prevalence in female animals (5.98%) was higher than in males (4.98%) though no significant difference was observed ($P=0.37$; $\chi^2=0.33$).

Haematological survey result

The overall mean PCV value of examined cattle was 29.29 ± 4.813 ($|t|=122.49$; df=404; $P=0.00$, 95%CI=28.82-29.79). The mean PCV of non infected cattle was slightly higher (29.30%) than that of infected animals (29.27%). 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.

Discussion

In the present study, the apparent density of tsetse flies caught

Peasant Associations	Altitude Range	No. of trap	*Glossina tachnoides* caught						
			♂	♀	Total	FTD	*Tabanus*	*Haematopota*	*Stomoxys*
Edida kutir 2	1160-1221	15	0	0	0	0	2	149	0
Dihanzibaguna	1136-1175	16	0	2	2	0.06	8	107	37
Esitsa	1008-1088	16	1	2	3	0.09	0	184	0
Ejenta	1103-1249	10	1	1	2	0.1	2	79	15
Total	**1008-1249**	**57**	**2**	**5**	**7**	**0.06**	**12**	**519**	**52**

♂:Male ; ♀:Female; FTD: fly/trap/day.

Table 1: Tsetse and other biting flies caught in Mandura district.

Variable	No. of examined	No. of positive	P-value	χ^2
Sex				
Male	171(42.22%)	8(36.36%)	0.37	0.33
Female	234(57.78%)	14(63.64%)		
Body Condition				
Poor	85(12.5%)	6(27.27%)	0.71	0.67
Medium	269(61.86%)	14(63.64%)		
Good	31(25.64%)	2(9.09%)		
Age				
≤ 3	79(19.51%)	6(27.27%)	0.53	1.26
3_6	227(56.05%)	10(45.46%)		
>6	99(24.44%)	6(27.27%)		

Table 2: The prevalence of bovine trypanosomosis and associated risk factors.

was 0.06 fly/trap/day in Mandura district. Other biting flies including *Stomoxys*, *Tabanus* and *Haematobota* were also caught. This result is lower than the finding of Teka et al. [5] in which they reported 0.31 and 29.62 fly/trap/day in two sites in selected villages of Arba Minch, southern Ethiopia and Tafese et al. [6] also reported 1.45 fly/trap/day of *Glossina* in East Wollega, Ethiopia. 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 5.43%. This result is consistent with the work of Teka et al. [5] which reported 4.43% bovine trypanosomosis prevalence in selected villages of Arba Minch; Adale and Yassine [7] which reported 6.3% in Wolaita zone of Kindo Koish district, Southern Ehiopia; Degneh et al. [8] reported 6.86% in Lalo Kile district of Oromia regional state; Alamayew et al. [9] which reported 6.9% in Chena district, south west Ethiopia and Denbarga et al. [10] which reported 4.2% in South Achefer district, Northern Ethiopia.

However, findings of this work is higher than the result reported by Hunde et al. [11] (1.02%) in West Gojam, Ethiopia; and Tadesse et al. [12] (2.66%) in Tselemti Woreda, Western Tigray, and lower than the reports of Zecharias and Zeryehun [13] (27%) in Arbaminch; Begna et al. [14] (14.2%) in Humbo district, southern Ethiopia; Melaku and Abebe [15] (10.67%) in Debre Elias district, North west Ethiopia; Dagnachew et al. [16] (11.33%) in Jawi district of Amhara region, and Achukwi and Musongong [17] which reported (14.3%) in Faro division, northern Cameroon. 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 sick animals.

Highest infection rate (6.82%) was recorded Ejenta village and the lowest was in Esitsa (3.45%). The Prevalence among districts and Peasant associations in this study could be attributed to the tsetse fly and/or other biting flies' population and type present in each peasant association which is dependent on micro climate, animal heard density, distance between herds and other various factors [18].

The proportion of *Trypanosoma vivax* in all sites of this study was higher (81.82%) followed by *T. congolense* (18.18%). This result is consistent with the report by Cherenet [19] and Cherenet et al. [20] in tsetse free areas of Amhara region. This result disagreed with the report by Abebe and Jobere [21] in which they reported 58% of the total trypanosomes detected were *T. congolense*. Zecharias and Zeryehun [13] in Arbaminch and Mulaw et al. [22] 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, age-wise analysis revealed that there was no significant difference in prevalence between age groups though a highest infection rate was recorded in young ones (7.59%). These results disagree with that of Tasew and Duguma [23] and Dagnachew et al. [16].

The difference of prevalence of trypanosomosis among the body condition score was also not significant ($p>0.05$) being higher in poor body conditioned animals than other groups. This finding is similar to the report by Bacha et al. [24]. The prevalence of infection between sex categories was 4.68% for male and 5.98% for females, but there was no statistically significant difference between sex groups ($p>0.05$). Similarly, Daya and Abebe [25] and Teka et al. [5] 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 ($|t|=122.49$; df=404; $P=0.00$, 95%CI=28.82-29.79). The mean PCV of non infected cattle was slightly higher (29.30%) than that of infected animals (29.27%). 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 [4] 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.

Conclusion

The present work showed a relatively low prevalence of trypanosomosis and apparent density of tsetse flies in Mandura 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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References

1. Abebe G (2005) Current situation of Trypanosomosis. In: review article on: Trypanosomosis in Ethiopia. Ethiop. J Biol Sci 4: 75-121.
2. Leak SG (1999) Tsetse biology and ecology: The role in the epidemiology and control of trypanosomosis. CAB International. Wallingford (UK), pp. 152-210.
3. Keno M (2005) The current situation of tsetse and trypanosomosis in Ethiopia, Ministry of Agriculture and Rural Development, Veterinary service department, in proceeding of 28th meeting of International Scientific Council for Trypanosomosis Research and Control.
4. Murray M, Murray PK, McIntyre WIM (1977) An improved parasitological technique for the diagnosis of African trypanosomosis. Transactions of the Royal Society of Tropical Medicine and Hygiene 71: 325-326.
5. Teka W, Terefe D, Wondimu A (2012) Prevalence study of bovine trypanosomosis and tsetse density in selected villages of Arbaminch. Ethiopia Journal of Veterinary Medicine and Animal Health 4: 36-41.
6. Tafese W, Melaku A, Fentahun T (2012) Prevalence of bovine trypanosomosis

and its vectors in two districts of East Wollega Zone, Ethiopia. Onderstepoort Journal of Veterinary Research 79: 34-43.

7. Adale E, Yasine A (2013) Prevalence of bovine trypanosomosis in Wolaita Zone Kindo Koish District of Ethiopia, African Journal of Agricultural Research 8: 6383-6387.
8. Degnah E, Fereda B, Bekuma B, Hunde A, Duguma M (2013) Prevalence of Bovine Trypanosomosis in Lalo Kile District, Kelem Wollega Zone, Oromia Regional State, Western Ethiopia. Acta Parasitologica Globalis 4: 34-40.
9. Alemayehu B, Bogale B, Fentahun T, Chanie M (2012) Bovine trypanosomosis: A threat to cattle production in Chena district, Southwest Ethiopia. Open J. of Ani Sci 2 : 287-291.
10. Denbarga Y, Ando O, Abebe R (2012) Trypanosoma Species Causing Bovine Trypanosomosis in South Achefer District, Northern Ethiopia. J Vet Adv 2: 108-113.
11. Hunde AB, Chanie TA, Ferede BW, Tesfaye AM (2012) Prevalence of Bovine Trypanosomosis in Addisamba and Amarit District of West Gojjam Zone, Amhara Regional State. American-Eurasian Journal of Scientific Research 7: 112-117.
12. Tadesse A, Hadgu E, Mekbib B, Abebe R, Mekuria S (2011) Mechanically transmitted bovine trypanosomosis in Tselemty Woreda, Western Tigray, Northern Ethiopia. Agricultural Journal 6: 10-13.
13. Zecharias A, Zeryehun T (2012) Prevalence of Bovine Trypanosomosis in Selected District of Arba Minch, SNNPR, Southern Ethiopia. Global Veterinaria 8: 168-173.
14. Begna F, Abebe S, Bekele M (2011) Bovine Trypanosomosis in Selected Villages of Humbo District, Southern Ethiopia. Global Veterinaria **7**: 192-198.
15. Melaku A, Abebe A (2012) Bovine Trypanosomosis and Its Vector Type and Density at Debre Elias District, North-western, Ethiopia. Journal of Advanced Veterinary Research 2: 247-251.
16. Dagnachew S, Girma H, Abebe G (2011) A cross-sectional study on bovine trypanosomosis in Jawi district of Amhara Region, Northwest Ethiopia. Ethiop. Vet. J 15: 69-78.
17. Achukwi MD, Musongong GA (2009) Trypanosomosis in the Doayo/Namchi (Bos taurus) and zebu White Fulani (Bos indicus) cattle in Faro Division, North Cameroon. Journal of Applied Biosciences **1**5: 807-814.
18. Sinshaw A, Abebe G, Desquesnes M, Yoni W (2006) Biting flies and Trypanosoma vivax infection in three highland districts bordering Lake Tana, Ethiopia. Vet. Parasitology 142**:** 35-46.
19. Cherenet TA (2004) Epidemiology of bovine trypanosomosis and its economic impact in tsetse-infested and tsetse-free areas of Amhara region, North-west Ethiopia, PhD thesis, Universiti Putra, Malaysia.
20. Cherenet T, Sani RA, Pananda JM, Nadzr S, Speybroeck N, Van den Bossche P (2004) Seasonal prevalence of bovine trypanosomosis in a tsetse-infested zone and a tsetse-free zone of the Amhara Region, north-west Ethiopia. Onderstepoort J. Vet.Research 71: 307-312.
21. Abebe G, Jobre Y (1996) Trypanosomosis: A threat to cattle production in Ethiopia. Rev. Vet. Med 147**:** 897-902.
22. Mulaw S, Addis M, Fromsa A (2011) Study on the Prevalence of Major Trypanosomes Affecting Bovine in Tsetse Infested Asosa District of Benishangul Gumuz Regional State, Western Ethiopia. Global Veterinaria **7**: 330-336.
23. Tasew S, Duguma R (2012) Cattle anaemia and trypanosomiasis in Western Oromia State, Ethiopia. Revue Méd. Vét 163: 581-588.
24. Bacha B, Beyene Z, Woyessa M, Hunde A (2013) Prevalence of Small Ruminants Trypanosomosis in Assosa District of Benishangul Gumuz Regional State, Western Part of Ethiopia. Acta Parasitologica Globalis 4: 99-104.
25. Daya T, Abebe G (2008) Seasonal dynamics of tsetse and trypanosomosis in selected sites of Ethiopia. Ethiop. Vet. J 12: 77-98.