European Journal of Biological Sciences 10 (2): 47-51, 2018
ISSN 2079-2085

DOI: 10.5829/idosi.ejbs.2018.47.51

Bovine Trypanosomosis in Four Settlement Areas Bordering Birbir River, Dale Wabera District, Western Ethiopia

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Abstract: A cross-sectional study aimed at estimating the prevalence of trypanosomosis in cattle and the apparent density of its vectors was undertaken from November 2009 to April 2010 in four settlement areas of the Dale Wabera district, western Ethiopia. A buffy coat technique was employed for the determination of trypanosomosis prevalence, while odor baited traps were used for the vectors survey. The overall prevalence of trypanosomosis was found to be 12.28%, 95%CI. The relative prevalence of trypanosome species was 1.53, 3.32 and 7.42% for *Trypanosoma brucei*, *T. vivax and T. congolense,* respectively. No significant difference was observed in trypanosomosis prevalence between study sites, age and sex groups. The mean PCV values of trypanosomosis positive (20%) were significantly lower to that of negative animals (26.80%).The apparent density of tsetse fly was 11.98 fly/trap/day (FTD). Three species of the genus, *Glossina*, including *Glossina morsitans* subspecies *morsitans*, *G. pallidipes* and *G. tachnoides* were captured from the area. This highest prevalence and apparent density indicate the severity of the problem in the studied area. Therefore, trypanosomosis and its vector control strategies should be implemented to safeguard the production and productivity of livestock.

Key words: Settlement area · Prevalence · Trypanosomosis · Tsetse

INTRODUCTION

African animal trypanosomosis impedes the extension of natural herds particularly in Africa where the presence of tsetse fly density access to fertile lands with good grazing potential and livestock rearing [1, 2]. It is a serious constraint to agricultural production in extensive areas of the tsetse infested regions [3, 4] which accounts over 10 million square kilometers of the tropical Africa. The disease is one of the top livestock health problems causing high morbidity and mortality to cattle, sheep, goat and equines. Generally, there is a great threat of trypanosomosis which hinder the economic development of sub-Saharan Africa and reasonable for the incalculable toll of human health [5].

The most economically important trypanosomes in livestock are the tsetse-transmitted species: *Trypanosoma congolense*, *T. vivax* and *T. brucei*. *Glossina* species commonly called 'Tsetse flies' are the biological vector of trypanosomes. In Ethiopia, these flies are confined to the southwestern and northwestern region, which covers an area of 220000 km². The river valleys of Abay, Baro-Akobo,Didessa, Ghibe, and Omo are infested by one and/or more tsetse fly species. Five species of tsetse fly including *G. morsitans* sub *morsitans, G. pallidipes,G. tachnoides, G.fuscipes fuscipes* and *G. longipennis* are documented to be found in the country and the first four are widely distributed and economically important [6].

Tsetse transmitted animal trypanosomosis remain as one of the largest causes of livestock production losses in Ethiopia. However, the magnitude of the disease and its vectors needs to be understood to implement the possible control strategies. Therefore, the aim of this study was to estimate the prevalence of trypanosomosis in cattle and relative abundance of tsetse fly in four settlement areas of Dale Wabera district, western Ethiopia.

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MATERIALS AND METHODS

Sample Size Determination and Sampling Method: The formula given by Thrustfield [7] for simple random sampling was used to determine the sample size, considering 50% expected prevalence and 0.05-desired absolute precision. Indigenous zebu cattle (N= 391) were randomly sampled from four study sites. The study sites include four settlement areas, namely Gosh Amba, Midega Birbir, Degaga Birbir and Lelisa Birbir, that were purposively selected based on farmers and area administrative complain of the problem. The sex, age and origin of cattle were explanatory variables used to associate with the disease prevalence. The age of study animals was estimated based on dentition techniques given by De Lahunte and Habel [8] and information from owners as well.

Study Design and Protocol: The study employed a cross-section study design, involving determination of the prevalence of trypanosomosis and an entomological survey of its vectors.

Blood samples were collected into heparanized microhematocrit capillary tubes (Deltalab S.L, Barcelona, Spain) after piercing the ear vein. Then one end of the capillary tube was sealed with crystal sealant (Hawksley Ltd, Lancing, UK) and centrifuged at 12000 revolutions per minute for five minutes [9]. After PCV was read and recorded, the capillary tube was then broken just below Buffy coat and expressed on microscopic slide, mixed and covered with a 22x 22 mm cover slip. Then it was examined under 40X objective of microscope using dark ground buffy coat technique.

Twenty traps were baited with acetone, Octenol and cow urine filled in separated bottles and deployed at an interval of 200-250 meters. After two days of trap deployment time, caught tsetse flies were identified to species level according to morphological characteristics [10].

Data Management and Analysis: The data were analyzed using STATA version 12.0 statistical software program. The prevalence of trypanosomosis was calculated. The association between the prevalence of trypanosome infection and associated risk factors were assessed by chi-square test, whereas the student's *t*-test (two-group mean comparison test) was used to assess the difference in mean PCV between trypanosome positive and negative animals. A statistically significant association between variables was said to exist if the P-value is <0.05 at 95%CI. Finally, the density of tsetse fly population was computed by dividing the number of flies caught by the number traps deployed and number of days of deployment, and expressed as fly/trap/day (FTD).

RESULTS

Parasitological and Hematological Examination Results: Out of the 391 of cattle examined, 48 animals were found positive for trypanosomosis. Prevalence, hence, is 12.28%, 95% CI and the relative prevalence based on *Trypanosoma* species was 7.42% ,3.32% and 1.53% for *T. congolense T. vivax* and *T. brucei,* respectively.

From 391 cattle examined in four settlement areas, 261 of them were male, out of which 34 (13.02%) animals were found trypanosomosis positive and 130 of them were females out of which 14 (10.78%) animals were infected (Table 2).

The prevalence of trypanosomosis based on age groups was 8.11 and 13.25% for young and adults, respectively.

Cattle that were test negative for the parasites were observed with a higher mean PCV value (26.80%) as compared to parasitaemic animals (20.00%).

Entomological Survey Results: By deploying 20 odors baited traps, 479 *Glossina* were captured, with the tsetse fly apparent density of 11.98 fly/trap/day. Out of the total caught tsetse flies, 113, 332 and 34 were *Glossina*

Table 1: Prevalence of trypanosomosis in four sites of Dale Wabera district

		Number of positive						
Sites	No. examined	T.b	T. c	T.v	Total	Prevalence	χ^2	p-value
Gosh Amba	101	1	9	3	13	12.87	4.5	0.21
Lelisa Birbir	96	1	6	3	10	10.42		
Midega Birbir	96	2	10	5	17	17.71		
Degaga Birbir	98	2	4	2	8	8.16		
Total	391	6	29	13	48	12.28		

Where T.b- *Trypanosoma brucei*, T.c- *T. congolense*, T.v- *T. vivax*

Table 2: Prevalence of trypanosomosis based on the sexes of cattle

Sex	Number of examined	Number of infected	Prevalence (%)	χ^2	P-value
Male	261	34	13.02	0.00	0.99
Female	130	14	10.77		
Total	391	48	12.28		

Table 3: Prevalence of trypanosomosis on age groups of cattle

Age groups	Number examined	Number infected	Prevalence (%)	χ^2	P-value
Young	74	6	8.11	1.47	0.22
Adults	317	42	13.25		
Total	391	48	12.28		

Young =age<3 years Adults =age ≥ years

morsistans sub *morsistans*, *Glossina pallidipes* and *Glossina tachnoides,* respectively. Higher proportion, 75% (359/479) were females and the rest, 25% (120/479) of them are males tsetse flies.

DISCUSSION

Even though various diseases induce livestock morbidity and mortality in Ethiopia, tsetse transmitted trypanosomosis is a deep-rooted problem. This finding showed an overall prevalence of 12.28%, 95%CI. Many authors reported similar values from different part of Ethiopia (Table 4).

The present work revealed that *T. congolense, T. vivax and T. brucei* were species of trypanosomosis causing cattle trypanosomosis in the studied area. Similarly, NTTICC [17] and Duguma *et al.* [18] also indicated these three species of trypanosomes are the dominant trypanosome species in Western Ethiopia.

The prevalence of trypanosomosis in Midega Birbir (17.71%), Gosh Amba (12.87%), Lelisa Birbir (10.42%) and Degaga Birbir (8.26%) was not significant, although it was highest in Midega Birbir (P>0.05). This could be related to similarities in epidemiological factors such as vector distribution and husbandry system.

Higher prevalence (13.02%) were observed in male than in female animals (10.78%), but the difference was not significant (p>0.05). Similar results reported by different researchers [19, 20].

The study revealed that the prevalence of the disease in young animals (<3 years) was lower than that in adults (≥3) but the difference was not significant (p>0.05) [21]. This may be because adult cattle move more distances for search of pasture and water that more expose them to vector bites.

The development of anemia might be the indication of trypanosome infection. Mean PCV values of parasitaemic animals were more significantly lower than that of aparasitaemic animals. Leak *et al*. [22], Rowlands *et al*. [23] and Bekele *et al*. [24] reported similar results. Considering the PCV value 24%-46% as normal PCV value of bovine, 87.5% of parasitologically positive and 28.9% of negative animals had PCV value of less than 24%. This suggests that PCV alone could not be used as the diagnostic criterion for trypanosomosis [25].

During the entomological survey, 479 tsetse fly species were caught and the apparent density was 11.98 fly/trap/day. Lelisa *et al*. [26] and Kassaye [27] reported fly densities of 10.5 and 13.01 fly/trap/day from western part of Ethiopia. Three species of tsetse fly including *Glossina morsistans* sub *morsistans*, *G. pallidipes* and *G. tachnoides* were captured from the area. Different studies from western Ethiopia showed these three species of *Glossina* are common in the area [28]. Greater proportions, (75%) of female tsetse flies were caught. This finding is in agreement with the report of Msangi [29]. Leak [30] concluded that in unbiased sample female would comprise

Table 4: Summary of trypanosomosis prevalence studies in different part of Ethiopia

Author	Year	Part of the Country	Area/district	Prevalence (%)
Fentahun *et al*. [11]	2012	Western Ethiopia	HawaGelan	12.40
Kedir *et al*. [12]	2016	Western Ethiopia	Seyo	13.14
Dagnachew & Shibeshi [13]	2011	Western Ethiopia	Sibu Sire & Guto Gida	11.33
Mekuria & Gadisa [14]	2010	North Western Ethiopia	Metekel &Awi	12.41
Desta *et al*. [15]	2013	Southern Ethiopia	Amaro	13.19
Teka*et al*. [16]	2012	Southern Ethiopia	Arba Minch zuria	14.97

70-80% of the populations. The higher population of female may be attributed to the fact that they live longer lifespan than males [31].

CONCLUSION

The high trypanosomosis prevalence (12.28%) and apparent density of its vectors (11.98FTD) indicates the seriousness of the problem. Therefore, appropriate trypanosomosis and its vector control strategies should be implemented in the area to improve the livelihood of the society.

REFERENCES

1. Abebe, G. and Y. Jobre, 1996. Trypanosomosis: A threat to cattle production in Ethiopia. Revue de Medicine Veterinaire, 147: 897-902
2. Uilenberg, G., 1998. A field guide for diagnosis, treatment and prevention of African animal trypanosomosis. Adopted from the original edition by boyt WP. FAO, Rome., 43-135.
3. Abebe, G., 2005. Current Situation of Trypanosomosis. In: review article on: Trypanosomosis in Ethiopia. Ethiop J. Biol. Sci., 4: 75-121.
4. Slingenbergh, J.H.W., 1992. Tsetse control and Agricultural development in Ethiopia, world Anim Rev., 70/71: 30-36.
5. Alsan, M., 2012. The effect of the tsetse fly on African development, National Bureau of Economic Research, 105 Massachusetts, Avenue, Suite 418, Cambridge, MA 02138, USA.
6. Langridge, W.P., 1976. Tsetse and trypanosomosis survey of Ethiopia. Ministry of overseas development UK., pp: 1-40.
7. Thrusfield, M., 2005. Veterinary Epidemiology; 3rd edition Black well science, Oxford, pp: 233.
8. DeLahunta, A. and R.E. Habel, 1986. Teeth, in A. De Lahunta and R.E. Habel (eds.), Applied Veterinary Anatomy, N.P., W.B. Saunders Company, Philadelphia.
9. Murray, M., P.K. Murray and W.I. McIntrye, 1977. An improved parasitological technique for the diagnosis of Africa trypanosomosis. Trans R trop Med Hyg., 71: 325-326.
10. Walle, R. and D. Shearer, 1997. Veterinary Entomology. Arthropod Ectoparasites of Veterinary Importance. London, UK, Champman and Hall, pp: 141-193.
11. Fentahun, T., M. Tekeba, T. Mitiku and M. Chanie, 2012. Prevalence of Bovine Trypanosomosis and Distribution of Vectors in Hawa Gelan District, Oromia Region, Ethiopia. Global Vet., 9(3): 297-302.
12. Kedir, M., K. Lelisa, D. Damena, B. Lema, T. Feyera and S. Debela, 2016. Bovine Trypanosomosis and Tsetse Fly Density in Seyo District, KellemWollega Zone, Western Ethiopia. Aus J Vet ScieAnim Husbandry, 3(2): 1028.
13. Dagnachew, S. and S. Shibeshi, 2011. Prevalence and vector distributions of bovine trypanosomosis in control (Sibu Sire) and non-control (GutoGida) districts bordering upper Anger valley of East Wollega Zone, Western Ethiopia. Ethiop Vet J., 15(2): 77-86.
14. Mekuria, S. and F. Gadisa, 2010. Survey on bovine trypanosomosis and its vector in Metekel and Awi zones of northwest Ethiopia, Acta Trop., 117: 46-151.
15. Desta, M., D. Beyene and S. Haile, 2013. Trypanosome infection rate of Glossinapallidipes and trypanosomosis prevalence in cattle in Amaro Special District of Southern Ethiopia. J Vet Med and Anim Health., 5(6): 164-170.
16. Teka, W., D. Terefe and A. Wondimu, 2012. Prevalence study of bovine trypanosomosis and tsetse density in selected villages of Arbaminch, Ethiopia. J Vet Med and Anim Health, 4(3): 36-41.
17. NTTICC., 2004. National Tsetse and Trypanosomosis Investigation and Control Center. Annual Report, for the period 7 thJune 2003 to 6thJuly 2004. Bedele, Ethiopia.
18. Duguma, R., S. Tasew, A. Olani, D. Damena, D. Alemu, T. Mulatu, Y. Alemayehu, M. Yohannes, M. Bekana, A. Hoppenheibatih, T. Habtewold, V. Delespaux and L. Duchaeau, 2015. Spatial distribution of Glossina species and Trypanosoma species in southwestern Ethiopia, parasites and Vectors, 9: 430.
19. Afework, U., 1998. Field investigation on the appearance of drug resistance population of trypanosomosis in Metekel district, North West Ethiopia. Faculty of veterinary Medicine, Frei University of Berlin, MSc thesis.
20. Tewelde, T., 2001. Study on the occurrence of drug resistant trypanosomes in cattle in the farming in tsetse controlled areas (FITCA) project in western Ethiopia. Debre zeit: Faculty of Veterinary Medicine, Addis Ababa University, MSc thesis.

21. Muturi, K.S., 1999. Epidemiology of Bovine trypanosomosis in selected sites of the southern rift valley Ethiopia MSc Thesis. FVM, AAU. DebreZeit, Ethiopia.
22. Leak, S.G.A., W.Mulatu, E.Authie, A.S.Peregrine, G.J.RowlandandJ.C.M. Trail,1993. Tsetse challenge and its relationship to trypanosomosis prevalence in cattle. Acta trop., 53: 121-134.
23. Rowlands, G.J., S.G. Leak, A. Peregrine, A.S. Nagda, S.M. Mulatu and G.D.M. d'Iteren, 2001. The incidence of new and the prevalence of recurrent trypanosome infection in cattle in southwest Ethiopia exposed to a high challenge tothe drug resistance parasite. Acta Trop., 79: 149-163.
24. Bekele, J., K. Asmare and G. Abebe, 2008. Evaluation of deltamethrin applications in control of tsetse and trypanosomosis in southern Rift Valley of Ethiopia. Ethiop Vet J., 29: 1-19.
25. Van den Bossche, P. and G.J. Rowlands, 2001. The relationships between the parasitological prevalence of trypanosomal infection and herd average PCV. Acta Trop., 78: 163-170.
26. Lelisa, K., S.Shimelis, J.Bekeleand D. Shiferaw, 2014. Bovine trypanosomosis and its fly vectors in three selected settlement areas of Hawa-Gelandistrict, western Ethiopia. Onder J Vet Research., 81(1): 715.
27. Kassaye, B.K., 2015. Prevalence of Bovine Trypanosomosis and Apparent Density of Tsetse Flies in Sayonole District Western Oromia, Ethiopia. J Veterinar Sci Technol., 6: 254.
28. Tekle, Y. and S. Mekonen, 2013. Prevalence of Bovine Trypanosomosis in Tsetse Controlled and Uncontrolled Areas of Eastern Wollega, Ethiopia. J. Scieninnov Res., 2: 61-75.
29. Msangi, S., 1999. Distribution, Density and infection rates of tsetse flies in selected sites of Southern rift valley of Ethiopia, MSc thesis, Addis Ababa University Faculty of veterinary Medicine, DebreZeit, Ethiopia and Frie University at Berlin.
30. Leak, S.G.A., 1999. Tsetse Biology and Ecology: Their role in the epidemiology and control of trypanosomosis.CAB.International, Wallingford, UK.
31. Lehane, M.J., 2005. The Biology of Blood-Sucking in Insects, second edition, Liverpool School of Tropical Medicine, Cambridge University Press, The Edinburgh Building, Cambridge, UK.