Global Veterinaria 8 (2): 168-173, 2012
ISSN 1992-6197

DOI: 10.5829/idosi.gv.2012.8.2.61312

Prevalence of Bovine Trypanosomosis in Selected District of Arba Minch, Snnpr, Southern Ethiopia

Abraham Zecharias and Tesfaheywet Zeryehun

College of Veterinary Medicine, Haramaya University, Haramaya, Ethiopia

Abstract: Cross-sectional study was conducted at Wozeka grid on the Southern part of the Arba Minch, which is located 536 km from the capital city Addis Ababa, in the southern Ethiopia,. The study was carried out from November, 2010 to March, 2011 on 461 indigenous cattle managed under small holder mixed crop-livestock production system to determine the prevalence of bovine trypanosomosis. This study employs parasitological survey by the use of buffy coat examination and hematological study by the use of packed cell volume (PCV). PCV was determined by the aid of hematocrit reader. The overall prevalence of bovine trypanosomosis in the present study was 27.5%, comprising 28.1% and 26.9% from Elgo-fango and Wozeka villages. The predominant species recovered was *T. congolense* (61.4) and the least was *T. vivax* (14.2). Mixed infection due to *T. congolense* and *T. vivax* (24.4) was also recorded in the study. Disparity in the prevalence of trypanosome infection was recorded in the different age groups and between the two sexes but the difference was not statistically significant ($p>0.05$). However, the prevalence rate of trypanosome infection in the poor body condition cattle was significantly higher ($p<0.05$) than the good body condition cattle. The PCV of aparasitemic and parasitemic animals fall the range of 23.0- 43.0% and 11.0-34.0%, respectively. The mean PCV of parasitemic animals was significantly lower (20.15±5.16) than the aparasitemic animals (26.86±5.95) ($p<0.05$). The present study revealed that a high tsetse density and trypanosomosis infection occur simultaneously. Sustainable community based tsetse and trypanosomosis control program should be implemented.

Key words: Bovine Trypanosomosis % Prevalence % PCV % Southern Ethiopia

INTRODUCTION

Ethiopia with its great variation in climate and topology possesses one of the largest livestock populations in Africa. The estimated livestock population in Ethiopia is 44.3 million cattle, 23.6 million sheep, 23.3 million goats, 2.3 million camels, 6 million equines [1] 23.6 million poultry [2].

Among the livestock, cattle directly provide food such as meat and milk, a non-food such as hide; and indirectly they also contribute to over 30% agricultural production by supplying essential inputs such as manure for replenishing soil fertility and restoring nutrients and animal traction and power for ploughing and threshing; increasing the productivity of small holdings (2-ILRI, 2000). Nevertheless, many factors affect the maximum benefit to be obtained from cattle. Livestock disease is among the major factors that affect the production and productivity and trypanosomosis is one of the most important diseases that influence livestock productivity in our country [3].

Trypanosomosis is a debilitating and fatal disease of various domestic animals. It is caused by infection with the protozoan parasite of the trypanosome spp. and is transmitted mainly by tsetse flies (cyclically) and other biting flies (mechanically) [4]. In Ethiopia, trypanosomosis is one of the major impediments to livestock development and agricultural production contributing negatively to the overall development in agriculture in general [5, 6] and to food self-reliance efforts in the South Nation, Nationalities and Peoples' Republic State (SNNPRS) in particular. A report by the Ministry of Agriculture have indicated that a considerable large area of up to 220,000 km^2 is infested with tsetse flies namely *Glossina pallidipes*, *Glossina morsitans*, *Glossina fuscipes*, *Glossina tachinoides* and *Glossina longipennis* [7] which

Corresponding Author: Tesfaheywet Zeryehun, College of Veterinary Medicine, P.O. Box 301, Haramaya University, Haramaya, Ethiopia. Tel: +0920556154, E-mail: tesfahiwotzerihun@yahoo.com.

correspond with tsetse-born trypanosomosis including some 180,000-200,000 square kilometer of agriculturally suitable land including the West and South-West of the country, which make 14 million heads of cattle, an equivalent number of small ruminants, nearly 7 million equines and 18.8 million camels at the risk of contracting trypanosomosis at any time [8].

Different species of trypanosome affect livestock in the country and the most important trypanosome species affecting cattle in Ethiopia are *T.congolense, T. vivax* and *T. brucei* [9]. Although trypanosomosis is considered as an important disease of cattle in the SNNPRS area [10] but systemic studies have not yet been carried out on the epidemiology, prevalence and economic significance of bovine trypanosomosis in this site. Therefore the objectives of the study were to determine the prevalence of bovine trypanosomosis and the species involved and its effect on blood parameters such as packed Cell volume.

MATERIALS AND METHODS

Study Area: The study was conducted at Wozeka grid which is located at 536 km on the Southern part of the Arba Minch along the way to South Omo (Jinka) from the capital city Addis Ababa. Geographically the area is situated 6° 2' 00" N and 37° 33'00" E at range of 1200-3125 meter above sea level (m.a.s.l.) with mean annual rain fall ranging from 750 to 930 mm and mean annual temperature ranging from 14°C-32°C. The vegetation is dominantly occupied by woody grass land (WGL) especially along the sides of grazing area and drainage lines and there is a height gallery of forest along the rivers. Acacia species are the most common woody vegetation in the area. Approximately ten hectares of the grass land is used for grazing and hay harvesting purpose. This area is considered as the major tsetse infested area, where *G. pallidipes* and Tabanus flies are abundant. The cattle populations in the area are more of indigenous and they are kept under traditional extensive husbandry system with communal herding.

Study Design: Cross sectional survey was conducted on 461 randomly selected animals to determine the prevalence of bovine trypanosomosis.

Study Population: A study was conducted on randomly selected local (indigenous) cattle that are kept in communal grazing system and brought to common watering points in and around the grass land zone of Wozeka-grid. Different sex and age groups were used in the study.

Sampling and Sample Size Determination: The study area was purposively sampled because of an ongoing research on tse-tse transmitted trypanosome. Since there was no previous survey conducted at Wozeka-Grid to determine the prevalence of trypanosomosis, the minimum sample size was determined based on the expected prevalence rate of 20% and absolute desired precision of 4% at confidence level of 95% [11].

Hematological Study: Blood samples were collected from the ear veins in heparanized capillary test tubes filled to their 3/4th length. The capillary tubes were centrifuged at 12000 rpm for 5 minutes in the micro-hematocrit centrifuge. Packed cell volume (PCV) was determined using PCV hematocrit reader and a PCV less than 25% was designated as anemic [12].

Parasitological Study: Some of the centrifuged blood filled capillary tubes were broken using diamond tipped pencil 1 mm below the Buffy coat to include the red blood cells layer and 3mm above the Buffy coat to include the plasma. The content was expelled on the microscopic slides and was smeared, then the slides were covered with 22x22 mm cover slip and it was examined under 40 x objectives and ×10 eye piece using dark ground Buffy coat techniques, to see the movement of the parasite [13]. Once the presence of the parasite is determined, small drop of the blood in the capillary tube is placed on a clean glass slide and spread by another slide at an angle of 45° to make a thin blood film and the slide was air dried and fixed with methyl alcohol, stained with Giemasa stain and air dried. Identification of the different species of trypanosomes was carried out based on their morphology and size under microscope with oil immersion objective lens [14].

Body Condition Scoring and Classification of Age: The body condition was done according to the method described by Nicholson and Butterworth [15] and recorded as good and poor. The age of the animal was grouped as young (between 1 and 3 years) and adult (=3 years) according to the classification followed by Bitew [16].

Data Analysis: The collected data during the study period were entered into Microsoft Excel 2007 program and was decoded. Association between risk factors and prevalence of trypanosomosis was determined by Chi square test (Fisher exact test) using SPSS software version 15.0 (SPSS Inc. Chicago. IL., USA). Values were considered significant at $p<0.05$.

RESULTS

Prevalence: In the present study, out of the total 461 examined cattle, 127 animals were found infected with trypanosomosis giving the overall prevalence 27.5% of which 61.4% was due to *T. congolense* and 14.2% was due to *T. vivax* while the rest 24.4% was due to mixed infection (*T. congolense and T. vivax*). The highest prevalence of trypanosome infection was found in Wozeka (26.1%) compared with Elgo-fango (28.9%); however, there was no significant difference ($p>0.05$) in the prevalence among the villages (Table 1). The overall prevalence rates of trypanosome infection in the different sexes, ages and body condition scores are shown in Table 2. In the present study the rate of trypanosome infection in cattle was higher in the female than the male counterparts, but this association was not statistically significant ($p>0.05$). Similarly, there was no significant association in the prevalence of trypanosome infection between young and adult cattle. On the other hand, parasitemic animals had significantly ($p<0.05$) lower body condition scores than aparasitemic cattle (Table 3).

Haematological Finding: The packed cell volume (PCV) of aparasitemic animals falls in the range of 23.0- 43.0% while in parasitemic cattle the PCV was in the range of 11.0-34.0%. From the total of 461 examined animals, 189 (41.0%) were anaemic having PCV ≤ 24.0% and most of the parasitemic cattle were anaemic (82.7%). The overall mean PCV of the examined animals was 25.01±5.16 %. The mean PCV of parasitemic animals were significantly ($p<0.05$) lower than that of the aparasitemic ones (Table 3).

DISCUSSION

The present study revealed an overall trypanosomosis prevalence of 27.5%. This finding was higher than previous reports. Different researchers [10, 16-19] reported a prevalence rate of 23%, 21%, 18.5%, 17.5%, 14.7%, 11.7% in western Ethiopia, Metekel district, Arbaminch district, Upper Didessa Valley and Southern Rift Valley areas, Abay Basin, northwestern Ethiopia,

Table 1: Prevalence of trypanosomosis in the two study sites

Sites	Number of examined	Number of positive	Trypanosome species			Prevalence (%)
			T. congolense	*T. vivax*	*Mixed*	
Elgo-fango	239	69	38 (55.1)	13 (26.1)	18 (26.1)	28.9
Wozeka	222	58	40 (69.0)	5 (8.6)	13 (22.4)	26.1
TOTAL	461	127	78(61.4)	18 (14.2)	31 (24.4)	27.5

$\chi^2 = 0.434$, P= 0.535

Table 2: Prevalance of Trypanosoma infection among the sex groups and in different catagories of age and body condition

Variables		Number of examined	Number of positive	Prevalence (%)	X^2-value	p-value
Sex	Female	153	47	30.7	1.153	0.319
	Male	308	80	26.0		
Age	Young	135	38	28.1	0.034	0.909
	Adult	326	89	27.3		
Body condition	Poor	141	56	39.7	24.074	0.000
	Good	273	56	20.5		

Table 3: The packed cell volume of cattle examined for trypanosome infection in the parasitemic and aparasitemic animals

Status	No. Examined	No. Examined (PCV ≤ 24%)	No. Examined (PCV > 24%)	Mean PCV (%)± SD	t-test	P-value
Parasitemic	127	105 (82.7%)	22 (17.3%)	20.15±5.16	11.166	0.000
Aparasitemic	334	84 (25.1%)	250 (91.9%)	26.86±5.95		
Total	461	189(41.0%)	272(59.0%)	25.01±6.49		

of tsetse infested regions respectively. The higher prevalence in the current study area might be due to less and infrequent use of various trypannocidal drugs as well as the increase of tse-tse challenge because of higher density of vectors in the study area.

According to literatures the most prevalent trypanosome species in tsetse infested areas of Ethiopia are *T. congolense* and *T. vivax.* The finding of this study revealed that the majority of the infection was due to *T. congolense* (61.4%) and the least was infection by *T. vivax* (14.2%). Mixed infection was also prevalent (24.4%). The higher infection rate of *T. congolense* in the study area is in agreement with trypanosome species prevalence data from other tsetse infested region of Ethiopia. An infection rate of 58.5% for *T. congolense* and 31.2% for *T. vivax* [20] were reported in southwest Ethiopia. An infection rate of 54.3% and 45.7% for *T. congolense* and *T. vivax,* respectively were reported from Northwestern Ethiopia. The dominant trypanosome species in the Abay Basin was *T. congolense* (66.1%) followed by *T. vivax* (20.8%) [19]. A higher proportion of *T. congolense* (84%) followed by *T. vivax* (14%) was reported in Ghibe area [21]. The predominance of *T. congolense* infection in cattle may be due to the high number of serodemes of *T. congolense* as compared to *T. vivax* and the development of better immune response to *T. vivax* infected animals [21, 22].

In the present study there was no statistical difference ($p>0.05$) in the prevalence of trypanosome infection in the two study sites. These might be because the areas are close to each other in almost a similar climatic and agro ecological condition. The occurrence of trypanosomosis frequently corresponds with the fly density (occurrence of the vectors) which is in turn dependent on those climatic factors as temperature, humidity and vegetation coverage of the area [23, 24].

Higher infection rates were observed in male animals than females in the present study but the difference was not significant ($p>0.05$). This result is similar to the finding of several researchers [10, 17-19]. The higher infection rate in males compared to females may be attributed to stress factors related to work where male animals are used for drought purpose and they have to walk long distance in areas where there is a high risk of tsetse challenge. This finding is in complete agreement with the result of Tewolde *et al.* [17].

In the present finding, most of the trypanosome infected cattle were animals greater than 3 years old (adult animals) (83.6%) compared with that of young ones (16.4%). This may be due to the exposition of adult animals for the vector (tsetse fly) when they are left freely for grazing and immunosuppression due to stress factors such as lactation in the females and when they are traveling a long distance through tsetse challenge areas for drafting purpose in males.Young animals are more resistant than adults to the infection with trypanosomosis and they are not commonly exposed for the vector [25]. The low prevalence in young animals may also be due to the natural protection to some extent by maternal antibodies [26].

In the present study, the rate of infection in the poor body condition animals was significantly higher ($p<0.05$) than the good body condition animals. The result was in complete agreement with previous studies [16, 19, 27].

Anemia was considered to be an important clinical sign and/or indicator of trypanosomosis [28] and the reduced performance of infected animals [29]. Cattle with PCV values $\leq$ 24% were considered anaemic [30]. In the present study, 85% of the parasitemic cattle were anaemic. Similar results were reported by Afewerk [31], at Pawe, North-West, Ethiopia (90%) and [18] at Merab, Abaya and Southern Ethiopia (88.9%). The mean PCV of parasetemic animals (20.15) was significantly lower ($p<0.05$) than the aparastiemic animals (26.86). These lowered PCV of parasitemic animals was previously reported in similar studies elsewhere [19, 32, 33].

The appearance of trypanososome negative animals with mean PCV values of $\leq$ 24% may be due to inadequate detection method used [12] or delayed recovery of anaemic situation after recent treatment with trypannocidal drugs or factors other than trypanosomosis such as compound effects of poor nutrition and hematophagious helminth infections such as haemonchosis and bunostomosis [34, 35].

The study concluded that regardless its dynamic extent, bovine trypanosomosis is the major constraint to cattle production in established settlement area in Gidole special district evidenced by the higher prevalence of 27.5% which indicates the gravity of the disease problem in the area. Therefore, strong and sustainable extension works should be done to create awareness of the livestock keepers to wisely use communal pastures, animal feed conservation and preservation. There should be a through survey of the dynamic of tsetse as well as other biting flies so as to challenge the intervention prematurely *visa vi* systematic treatment of affected animals. Furthermore, an integrated and sustainable tsetse control targeted the vector on the parasite and the animals at risk in the area should be considered.

REFERENCES

1. Central Statistical Agency. CSA., 2004. Central Statistical Agency, Federal Dmocratic Republic of Ethiopia.
2. International Livestock Research Institute ILRI., 2000. Hand book of livestock statistics for developing countries socio-economic and policy released working paper, Nairobi, Kenya, pp: 2007.
3. Dagnatchew, Z., 1982. Trypanosomiasis in Ethiopia. Proceedings of the 3rd International Symposium on Veterinary Epidemiology and Economics. Available at www.sciquest.org.nz.
4. ILRAD., 1992. International Laboratory for Research in Animal Disease, Annual Report, Nairobi, Kenya.
5. Taylor, K.A., 1998. Immune responses of cattle to African trypanosomes: protective or pathogenic? International Journal of Parasitology, 28: 219-240.
6. Tesfaye, M., 2002. Report of Trypanosome infection rate in *G. m. morstans* and *G. tachninoides* in Didessa Valley from July 29 to September.
7. Ministry of Agriculture. MOA., 1997. Ruminant Livestock Development Strategy (RLDS), Addis Ababa, Ethiopia.
8. Langridge, A.P., 1976. A tsetse and trypanosomosis survey of Ethiopia, Ministry of overseas department, pp: 1-40.
9. Abebe, G., 2005. Trypanosomosis in Ethiopia, Ethiop. Journal of Biological Science, 4: 75-121.
10. Terzu, D., 2004. Seasonal dynamics of tsetse and trypanosomosis in selected sites of Southern Nation, Nationalities and peoples Regional State, Ethiopia. Msc thesis, Addis Ababa University, Faculty of Veterinary Medicine, Debre Zeit, Ethiopia, pp: 1-180.
11. Thrusfield, M., 2005. Veterinary Epidemiology. 3rd ed., UK, Blackwell science Ltd, pp: 233-250.
12. Murray, M., P.K. Murray and W.I.M. McIntyre, 1977. An improved parasitological technique for the diagnosis of African trypanosomisis. Transaction of the Royal Society of Tropical Medicine and Hygiene, 71: 325-326.
13. Woo, P.T.K., 1996. The hematological centrifugation technique for the detection of trypanosomes. Canadian Journal, 47: 921-923.
14. Paris, J., M. Murray and F. Mcodimba, 1982. A comparative evaluation of the parasitological technique currently available for the diagnosis of African Trypanosomosis in cattle, Acta Tropica, 39: 1-11.
15. Nicholson, M.J. and M.H. Butter worth, 1986. A guide to condition scoring of zebu cattle. ICCA, Addis Ababa, Ethiopia.
16. Bitew, M., Y. Amedie, A. Abebe and T. Tolosa, 2011. Prevalence of bovine trypanosomosis in selected areas of Jabi Tehenan district, West Gojam of Amhara regional state, Northwestern Ethiopia. African Journal of Agricultural Research, 6: 140-144.
17. Tewolde, N., G. Abebe, M. Eilser, Mc. Dermott, J. Grierner, M. Afework, M. Kyule, S. Munstermann, K.H. Zessin and P.H. Clausen, 2004. Application of field methods to assess Isometamedium resistance of trypanosome in cattle in Western Ethiopia. Acta Tropica, 90: 163-170.
18. Muturi, K., 1999. Epidemiology of bovine trypanosomosis in selected sites of the Southern Rift Valley of Ethiopia. Msc thesis, Addis Ababa University with Freie Universitants, Berlin.
19. Nigatu, S.D., 2004. Epidemiology of bovine trypanosomosis in the Abbay Basin areas of Northwest Ethiopia. Msc thesis, FVM, AAU, Debre Zeit.
20. Abebe, G. and Y. Jobre, 1996. Trypanosomiasis: A threat to cattle production in Ethiopia. Revue De Medecine Veterinaire, 147: 897-902.
21. Rowlands, G.J., W. Mulatu, E.D. Authie, S.G.A. Leak, S.M. Nagna and A.S. Pregrine, 1993. Epidemiology of bovine trypanosomiasis in the Ghibe 8 Valley, South-West Ethiopia. Factors associated with variations in trypanosome prevalence, incidence of new infections and prevalence of recurrent infections. Acta Tropica, 53: 135-150.
22. MacLennan, K.J.R., 1980. Tsetse transmitted trypanosomosis in relation to the rural economy. Wild Animal Review, 36: 2-22.
23. Leak, S.D., 1999. Tsetse Biology and Ecology: The role in the Epidemiology and control of trypanosomosis. CAB international. Wallingford (UK), pp: 152-210.
24. Abebayehu, T., E. Hadgu, B. Mekbib, R. Abebe and S. Mekuria, 2011. Mechanically Transmitted bovine trypanosomosis in Tselemty Woreda, Western Tigray, Northern Ethiopia. Agricultural Journal, 6: 10-13.
25. Fines, R., 1970. Pathogenesis and pathology of animal trypanosomiasis. In the African Trypanosomosis. H.W. Mulligan, A. George and Unwin/Ministry of overseas Development, Great Britain.
26. Fimmen, H.O., D. Mehlitz, F. Horchiners and E. Korb, 1999. Colostral antibodies and *Trypanosome Congolese* infection in calves. Trypanotolerance research and application GTZ, No, 116, Germany, pp: 173-178.

27. Mussa, A., 2002. Prevalence of Bovine Trypanosomosis in Goro wereda, Southwest Ethiopia. DVM Thesis, FVM, AAU, Debre Zeit.
28. Radoostitis, O.M., Gay, C.C. Hinch K.W. Cliff and P.D. constable, 2007. Disease associated with Trypanosomosomes. *In*: Veterinary Medicine, Text book of disease of cattle, horses, pigs and goats10th ed. Elsevier, UK., pp: 1531-1554.
29. Trail, J.C.M., G.D.M. Ieteren, M. Murray, G. Ordner, G. Yangari, J.C. Maille, P. Viviani, C. Colardelle and B. Sauveroche, 1993. Measurements of trypanotolerance criteria and their effect on reproductive performance of N'Dama cattle. Veterinary Parasitology, 45: 241-255.
30. Vanden Bossche, P., W. Shumba and P. Makhambera, 2000. The distribution and epidemiology of bovine trypanosomosis in Malawi. Veterinary Parasitology, 88: 163-176.
31. Afewerk, Y., 1998. Field investigation on the appearance of drug resistant population of trypanosomes in Metekel district, northwest Ethiopia. Addis Ababa University and Freiuniverstat Berlin, Faculty of Vetrinary Medicine, Ethiopia, MSc Thesis.
32. Dinka, H. and G. Abebe, 2005. Small ruminant trypanosomosis in the southwest of Ethiopia. Small ruminant Research, 57: 239-243.
33. Sinishaw, A., G. Abebe, M. Desquesnes and W. Yoni, 2006. Biting flies and *Trypanosoma vivax* infections in three highland districts bordering Lake Tana, Ethiopia. Veterinary Parasitology, 142: 35-46.
34. Afework, Y.S., P.H. Clausen, G. Abebe, G. Tilahun and D. Mehlitz, 2000. A prevalence of multiple drug-resistant *T. congolense* population in village cattle of Mekele district, North-Wet Ethiopia, Acta Tropica, 76: 231-138.
35. Vanden Bossche, P. and G.J. Rowlands, 2001. The relationship between the parasitological prevalence of trypanosomal infection in cattle and herd average packed cell volume. Acta Tropica, 78: 163-170.