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Prevalence of Bovine Trypanosomiasis in Chora District in WestOromia, Ethiopia

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Abstract: The present study was conducted to determine the prevalence of bovine trypanosomosis in Chora district Illuabbabora zone of west Oromia region from December 2013 to march 2014. Blood samples were collected randomly from ear vein of randomly selected 278 Zebu cattle. The examination was done in clinic and Bedele regional veterinary diagnostic laboratory. Hematocrit centrifuge technique with hematocrit reader was used to measure PCV values and to judge if the animal is anemic or not. Furthermore, wet smear was done to detect the parasite and Giemisa staining technique was also employed for trypanosomes species differentiation. The result of this study shows that a total of 52 cattle were found to be infected with different species of trypanosomes. Meanwhile, species prevalence shows that 25 [8.99%] infected with *T.cogonlonse,* 13 [5.52%] with *T. Vivax* and *T.brucei* 7[2.52%] and 7[2.52%] were found to be infected with mixed of *T.congolonse*and *T. vivax*. The proportional prevalence of *T. congolense*is significantly higher (P<0.001) than the other trypanosome species. Infection rate was statistically significantly higher in cattle with poor body condition. The mean PCV values recorded were 26.5% inaparasitaemic and 19.5% inparasitaemic animals with a statistical significant difference (P<0.05). The current study demonstrated that trypanosomosis is among the major health and productivity constraints warranting control intervention.

Key words: PCV · Prevalence · Trypanosomes · Anemic · Parasitaemic · Aparasitae

INTRODUCTION

Livestock in Ethiopia provides draft power in land cultivation.Income generating to farming communities means of investment and important source of import and export foreign exchange earing to the nation at direct and indirect commodities in the world market, more over live stock is important culture resource social safety net and means of saving, however the economic benefited derived from the livestock subsector does not commensurate with the potential. This is due to various factors such as traditional systems of husbandry and management, poor genetic potential as well as the presence of many diseases [1]. Among these trypanosomes; tsetse cyclical transmitted trypanosomosis is one of the most important constraints to livestock and agriculturaldevelopment in sub humid zones of Africa.

Trypanosomes is a protozoan disease of animal and human caused by flagellated parasite from the genus *Trypanosoma*, which are found in the blood plasma and various body tissues fluid. The disease is usually chronic extending over several months and characterized by intermittent fever, progressive emaciation, weakness, anemia, loss of condition and death [2]. The overall economic loss in the continent due to the disease was estimated betweenUS $1408 and 1540 million per annum. In Ethiopia at least 10 million heads of cattle already exposed to the disease and suffer from death.Hide and skin damage contributing in decreasing animal product and byproduct in the country [3]. Furthermore, livestock cannot be introduced in to sum 155,000- 220,000km of the most fertile land in the south west and western region. Most Africantrypanosomes are transmitted by tsetse flies, which inhabit many parts of the continent [4, 5].

Tsetse infests 10 million square kilometers between latitudes of 14°N and 29°S. Thirty eight African countries affected by the disease known as nagana [6]. In Ethiopia, about 240,000km^{2}of land located in the Southern, South Western, Western and North Western parts is infested by tsetse flies and preclude farmers from rearing livestock [7].

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The most important trypanosome species affecting livestock in Ethiopia are *T. congolense, T. vivax* and *T. brucei*, in cattle, sheep and goat, *T. evansi*in camel and *T. equiperdum*in horse [8, 9].

There is no vaccine against for the disease due to the ability of its antigenic variation of variant surface glycoprotein (VSGs) and no new drugs have been marketed for the treatment or prevention of bovine trypanosomosis in the past 50 years [10]. During the past decade, different prevention and control measures were implemented in order to reduce the impact of trypanosomosis in the area by National tsetse and trypanosomosis investigation and control center (NTTICC) in collaboration with Choraworeda agricultural office, however, trypanosomosis is still considered as an important disease in the district. Therefore, the objective of this study was to determine the prevalence of bovine trypanosomosis in Chora district and its associated risk factors.

MATERIALS AND METHODS

Study Area: The study area was located in Oromia region, Illuabbabor zone about 515 km from Addis Ababa to the west .The district receives an average rainfall ranging of 1500-2300 mm and located at altitude of 1450-2300 m.a.s.l. with minimum and maximum annual temperature from 10°C and 32°C, respectively [11]. The district covered with different type of vegetation forest including with a vast coffee plantation and has different wild games including buffalo, bush pig kudu, monkey and apes. Agriculture is the main livelihood of the people with mixed farming, including raring of livestock, crop production, honey production and coffee plantation [12]. The study was conducted in three peasant association, namely Semayero, Sololo and Chiirache.

Study Animals and Sampling Strategy: In this study randomly selected local zebu cattle managed under traditional communal grazing system was used. During the study a total of 278 cattle were examined, before sampling, age, sex, body condition, peasant association, traditional name of the cattle with respected cattle owners were registered. The number of animals required for the study was determined using the formula given by Thrus field [13] for multi-stage sampling, by using 95% level of confidence, 20% expected prevalence (NUTTIC report) and 0.05 desired absolute precision. Thus, 278 cattle were needed for the study.

Study Design: A cross-sectional study was used to estimate the current prevalence of bovine trypanosomosis and vectors in the study area from December 2013 to March 2014. The PA's were selected based on their accessibility to transport and information from the district's administrative body. Multistage sampling was used to sample animals, where, herds were selected from each PA's by simple random sampling as primary sampling units. From the selected herds, individual animals to be sampled were selected by simple random sampling techniques as secondary sampling units.

Study Methodology

Survey of Trypanosomosis: For detection of trypanosome blood sample were collected from marginal ear vein, it is accomplished by pricking the edges of the ear vein using lancet.One end of the capillary tube was sealed and centrifuged at 12,000rpm for 5 min to separate the blood cells and to concentrate trypanosomes using centrifugal forces as buffy coat. Then PCV was measured using haematocrit reader. The capillary tubes were broken just 1mm below buffy coat and expressed on microscopic slide, mixed and covered with 22x22mm cover slip. Then it was examined under 40x objective of a microscope using dark ground buffy coat technique to detect the presence of the parasite [14]. Buffy coat positive samples were stained by Giemsa's in thin blood smears, fixed with methanol for 5 min and examined under oil immersion using 100x objectives to identify the species of trypanosomes [15].

Trypanosome Infection and its Associated Risk Factors: During collection of sample necessary information such as owners name, date, Name of Peasant association, Sex, age and Body conditions are correctly recorded. The body condition score were classified as poor, medium and good by observing the body condition of the animals in the field [16]. The ages of animals were also estimated by the dentition method Gatenby [17] and from owner information. The age of animals was categorized into three groups; less than two, between 2 and 4, and above four years old.

Data Analysis: Percentages (%) were calculated to determine prevalence and chi-square association. Categorical data were analyzed by using chi-square (X^2) test of independence where as t-test was used to examine the difference in mean PCV between the study variables. In all cases, Confidence level was held at 95% using stata 7.

Table 1: The prevalence of Bovine trypanosomosis in the study area

		Buffy coat results							
PA	No	*T. vivax*	*T.conglonse*	*T. brucei*	*T.vivax* & *T. brucei*	Total	Prevalence	x^2	*P-value*
Semayero	86	1	5	2		8	9.3%	16.85	P<0.001
Chiirache	96	3	6	2	3	14	14.5%		
Sololo	96	9	14	3	4	30	31.5%		
Total	278	13	25	7	7	52	18.71		
Prevalence%		4.67	8.99	2.55	2.55	18.71			

Table 2.Prevalence of bovine trypanosomiasisand its associated factors

Risk factors	N	Positive	Prevalence%	x^2	P value
PA					
Semayero	86	8	9.3	16.85	P<0.001
Chiirache	96	14	14.5		
Sololo	96	30	31.5		
Total	278	52	18.57		
Sex					
Female	97	35	36.1	0.039	P>0.05
Male	181	17	9.34		
Total	278	52			
Body condition					
Good	55	4	7.3	6.31	P<0.05
Medium	117	19	16.24		
Poor	106	29	27.34		
Total	278	52	18.71		
Age					
less than 2 years	45	5	8.89	3.21	P>0.05
2-4 years	92	15	16.24		
Above 4 years	141	32	27.36		
Total	278	52	18.71		

Table 3: Mean PCV of infected and non infected animals in the study area

Condition	No of observation	Mean PCV±CI 95%	T value	P-value
Parasitemic	52	19.5±1.3	1.04	P<0.001
Aparasitimic	226	26.5±1.1		

RESULTS

Parasitological Findings: A total of 52 cattle (30)in Sololo, (14) in Chiirache and (8) inSemayeropeasant associations werefound to be infected with a prevalence rate of 31.5%, 14.5%, 9.3%. The majority oftrypanosome infections in the study area were infection due to *Trypanosomecongolonse*. In all peasant associations *T.conglonse* was the main trypano some species, followed by *T.vivax*, *T. brucei* andamixed infection of (*T. vivax*and *T. brucei*) with a prevalence of 8.99%, 5.52%, 2.52% and 2.52%, respectively as indicated in Table (1).

Trypanosome Infection and its Associated Risk Factors: The prevalence of trypanosome infection between age categories of less than two years old, between 2 and 4 and above 4 years old was not significant (P>0.05) even if prevalence is higher in above four years old cattle. The prevalence of trypanosome infection was higher in female (36.1%) than male (9.34%) animals but it was not statistically significant (P>0.05). However statistical insignificant difference was recorded among body conditionsof animals with good (7.3%), medium (16.24%) and with poor (27.34%) body conditions werepositive for trypanosomosis as presented in Table (2).

The overall mean PCV values were significantly different between parasitaemic and aparasitaemic animals in the district.The mean PCV of infected animals was significantly lower (p<0.001) than themean PCV of non infected animals (Table 3).

Discussion

Trypanosomosis: Bovine trypanosomosis is present in the current studied Districtswith an overall prevalence of

18.71% and dominance of *T. congolense*over *T. vivax*. This result is much higher than withprevious report (3.9%) recorded by Geremew *et al.* [18] from the neighboringdistrict Yayo district,western Ethiopia. However, similarfigures were reported from different parts of tsetse infested areas inEthiopia: a prevalence of 15.1%, in West Ethiopia [19] 21% inSouthern Rift valley areas of tsetse infested regions [20] 17.2% in Metekel [21, 22] and 17.5% in upper Didessa of tsetse infested regions. The dominant species in this area of tsetse infested regions was *T.congelense* [23] suggesting that exclusively tsetse transmittedtrypanosomosis is the major problem in these areas. On the otherhand, in the highland areas of Ethiopia, non-tsetse transmittedtrypanosomosisis the major problem [24].

A higher prevalence wasfound in this study compared to the works of these authors elsewherein west Oromia, Ethiopia. This disparity emanates from many factors that explainthe higher prevalence of trypanosomosis observed in this study area. The explanation for the higher prevalence rate detected in this study could be related to distribution, challenges and density of parasite vector as well as vector control management practice [25].

Trypanosome infection as a cause of anaemia was evidenced by the decrease in packed cell volume of the infected animal [26, 27]. The mean PCV value recorded inthis study was also significantly lower ($P<0.001$) in parasitaemic (19.5%) than in aparasitaemic (26.5%) animals. This is in agreement with previously reportedmean PCV values in parasitaemic than in aparasitaemicanimals of 21.16% than 25.4% [28] 22.1 % than 29.1 [29] 24.6% than 29.16% [30] 21.1% than 26% [31].

The difference in mean PCV value between parasitaemic and aparasitaemic animals indicates that trypanosomosis involves in reducing the PCV values in infected animals [32]. The damage of tissue due to trypanosomosis is probably multi factorial in etiology, but the underling feature is the progressive anemia throughout the cores of disease. The case of anemia is due to hemolysis caused primarily by erythrophagocytosis due to simulation and expansion of mononuclear phagocytosis system [33].

Trypanosome Infection and its Associated Risk Factors: In this study, there was statistical significant difference between the prevalence of bovine trypanosome infection and among the three districts ($P>0.05$). Sololo district, 31.5%, whereas the lowest was recorded in Semayerodistrict,9.3% during the study period. This might be due to the difference in management system, vector density, poor veterinary services, ecological difference, and lack of awareness of the animal owners about the disease.

In this study, age-wise analysis revealed that there wasn't statistical significant difference between age groups and the disease ($P>0.05$) in which higher infection rate was recorded above 4 years. In this study age was not a risk factor for the prevalence of trypanosomosis in the study area. On the contrary, other reports show that *T. congolense* is a chronic disease increasing with age of animals and its infection is usually higher in adult animals than in young animals [34,35] and they found that cows >9 years old had 1.2 times higher trypanocidal drug treatment than <3 years old animals.

A higher prevalence rate was recorded in female than male but was not statistically significant however,different works were also reported that higher infection rate was observed in male cattle than females [36, 37] and the possible suggestion to this finding could be that males are more used for drought purpose, travel long distances to an area of tsetse challenge for grazing, plough and stressed by draft power and become susceptible to trypanosomosis.

CONCLUSION AND RECOMMENDATIONS

In the district the overall prevalence of trypanosomosis was found to be 18.71%. The most widely distributed and dominant species of trypanosomes was *T. congolese.*Significant reduction in the level of PCV was observed due to the disease. Mechanical transmitters such as the genus *Stomoxys*,*Hematopota*, and tabanid have a secondary role net to a cyclical transmission of the disease with in a tsetse belt and area of bordering at the edge of tsetse belt. *T.vivax* appears is more easily transmitted by this rout than others. If the problem of trypanosomiasis is resolved and the potential land existing the area and thepresent livestock will be effectively utilized. From the above conclusion, the following points are recommended for further attention.

Necessary training and public health awareness creation work should be undertaken to overcome drug resistance and to make them aware of the impacts of traypanosmiasis and integrated vector control by using target, spot on by deltamethrin, must be exercised. Treatment of sick animal using prophylactic and chemotherapeutic treatments should be exercised at regular interval with proper dilution.

REFERENCES

1. MOARD, 2009. Ministry of agriculture and Rulardevelopment, animal and plant health regulatory directorate (APHRD, 2009). Adiss Ababa, Ethiopia. pp: vi.
2. Uquart, G.M., J.J. Armour J. Duncan, A.M. Dana and F.W. Jenning, 1996. vetparsitology 2ed edition.
3. Jordan, A.M., 1986. Trypanosomiasis control and Africa rulardevelopment.long man UK and USA. pp: 357.
4. NTTICC (National Tsetse and TrypanosomosisInvestigation and Control Center), 1996. Annual Report on Tsetse and Trypanosomosis Survey, Bedelle, Ethiopia.
5. Donelson, J.E., 2003. A review on antigenic variationand the African trypanosome genome. Acta Tropica, 85: 391-404.
6. Radostits, O.M., C.C. Gay, K.W. Hinchcliff and P.D. Constable, 2007. Veterinary medicine. A text book of the disease of cattle, horse, sheep, pigs and goats, 10th edition. By Saunders Elsevier, Edinburgh, pp: 1534.
7. STEP, 2012. Ministry of Science and Technology. Southern tsetse eradication project (step). Field operation manual of tsetse and trypanosomosis control and monitoring, Addis Ababa, Ethiopia, pp: 5-63.
8. Feyissa, G., M. Aynalem, H. Birhanu, C. Gemechu and A. Gezahegn, 2015. Epidemiological status and vector identification of bovine trypanosomiosis in Didesa District of Oromia Regional State, Ethiopia. Int. J. Nutr. Food Sci., 4(3): 373-380.
9. Abebe, G., 2005. Trypanosomosis in Ethiopia. Ethiop, J. Bio. Sci., 4(1): 75 -121.
10. Van den Bossche, P. and G.J. Rowlands, 2001. The relationship between the parasitological prevalence of trypanosomal infections in cattle and herd average packed cell volume. Acta Tropica, 78: 163-170
11. NMSA (National Meteorological Services Agency), Monthly report on temperature and Rainfall. Distribution for Illuabbaborzone, Regional Metrological.
12. CSA (Central Statistical Authority), 2005. Agricultural Sample Survey, Statistical Bulletin,
13. Thrusfield, M., 2005. Veterinary epidemiology, 3rd edn, UK, Blackwell Science Ltd, pp: 233-250.
14. Murray, M., J.C.M. Truil, D.A. Turner and Y.J. Wissoiq, 1983. Animal health and livestock productivity trypanotolerance network –Training manual .ILCA, pp: 4-16.
15. Hendri, 2002. Laboratory procedure for veterinary technician ,fourth edition, printed in USA .Philladeliphia, pp: 314-317.
16. Nicholson, M.G. and M.H. Butterworth, 1986. A guide to condition scoring of Zebu cattle. International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia.
17. Gatenby, R., 1991. The Tropical Agriculture, London and Beging Stock McMillan Education Ltd. ACCT, pp: 6-10.
18. Geremew Haile1, Negesse Mekonnen1, Kumela Lelisa and Yitbarek Habtamu, 2016. Vector identification, prevalence and anemia of bovine trypanosomosis in Yayo District, Illubabor Zone of Oromia Regional State, Ethiopia Ethiop. Vet. J., 20(1): 39-54 18.
19. Bekele, J., K. Asmare, G. Abebe, G. Ayelet and E. Gelaye, 2010. Evaluation of Deltamethrin applications in the control of tsetse and trypanosomosis in the southern rift valley areas of Ethiopia. Vet. Parasitol., 168: 177-184.
20. Richard, M.W., J.C. Spitzer and M.B. Warner, 1986. Effects of Varying Levels of Postpartum Nutrition and Body Condition at Calving on Subsequent Performance in Beef Cattle. Inter J. Anim Sci., 62: 300.
21. Afework, Y., P.H. Clausen, G. Abebe, G. Tilahun and D. Mehlitz, 2000. Multiple drugs Resistant Trypanosomacongolense populations in Murray village cattle of Metekel District North West Ethiopia. Actatropica, 76: 231-238.
22. Misganaw, T., 2006. Study on bovine trypanosomosis and tsetse fly in Quara settlement Area of North Gondor Zone, Amhara national Regional state. DVM thesis, Addis Ababa University Faculty of Veterinary Medicine, Debre-Zeit, Ethiopia.
23. Tewelde, T., 2001. Study of the occurrence of drug resistant Trypanosome in Cattle in the farming in tsetse controlled area (FITCA) Project in West Ethiopia. MSc. Thesis Addis Ababa University Faculty of VeterinaryMedicine, Debre-Zeit, Ethiopia.
24. Rowlands, G.J., W. Mulatu, S.M. Nagda, R.B. Dalon and G.D.M. D'Ieteren, 1995. Genetic Variation in Pack red cell volume and frequency of aparasitaemic in East Africa Zebu cattle exposed to Drug Resistant Trypanosomes Ivestock Production Sciences, 43: 75-84.
25. Ford, J. and K. Katondo, 1977. Maps of tsetse fly (Glosina) distribution in Africa 1973. According to sub-generic groups on scale of 1:5,000,000. Bulletin of animal.

26. Cherenet, T., R.A. Sani, N. Speybroeck, J.M. Panandam, S. Nadzr and P. Van den Bossche, 2006. A comparative longitudinal study of bovine trypanosomiasis in tsetse-free and tsetse-infested zones of the Amhara Region, northwest Ethiopia. Veterinary Parasitology, 140: 251-258.
27. Van den Bossche, P. and G.J. Rowlands, 2001. The relationship between the parasitological prevalence of trypanosomal infections in cattle and herd average packed cell volume. ActaTropica, 78: 163-170.
28. Alekaw, S., 2003. Prevalence of BovineTrypanosomosis in three Woreda of Amhara Region Msc Thesis, Faculty of Veterinary Medicine, Addis Ababa University DebreZeit.
29. Abdalla, M.A., A.O. Bakhiet and S.E. Suliman, 2008. Seasonal prevalence of bovine trypanosomosis in Abu Bugar District, Central Sudan. Sudan Journal of Veterinary and Animal Husbandry, 47: 1-5.
30. Cuglovici, D.A., D.C. Bartholomeu and J.L. Reis Cunha, 2016. Epidemiologic aspects of an outbreak of Trypanosomavivax in a dairy cattle herd in Minas S. Brazil. Veterinary Parasitology, 169: 320-326.
31. Kebede, N. and A. Animut, 2009. Trypanosomosis of cattle in selected districts of Awizone,northwestern Ethiopia. Tropical Animal Health and Production, 41: 1353-1356.
32. Stephen, L.E., 1986. Trypanosomosis: A Veterinary Prospective, Pergamon Press, Oxford.
33. Muturi, K.S., 1999. Epidemiology of bovine trypanosomosis in selected sites of southern Rift Valley of Ethiopia. MSc Thesis, Addis Ababa and Free University of Berlin.
34. Jemene, B., 2004. Control of tsetse and trypanosomosis in the southern Rift valley (Step Area); Evaluation of Deltamethrin application. DVM thesis Addis Ababa University Faculty of Veterinary Medicine, DebreZeit, Ethiopia.
35. Tafese Hailemariam, Mintesnot Tsegaye, Garoma Desa and Kumela Lelisa, 2018. Prevalence of major trypanosomes affecting bovine in two Districts of North Western Ethiopia. European Journal of Biological Sciences, 10(4): 95-101.
36. Rowlands, G.J., W. Mulatu, E. Authie, G.D.M. D'Ieren and S.G.A. Leak, 1993. Epidemiology of bovine Trypanosomosis in the Ghibe Valley, South West Ethiopia. 2 associted with variations in trypanosome prevalence, in incidence of new infections and prevalence of recurrent infections. Actatropica, 53: 135-150.
37. Leak, S.G., W. Mulatu, E. Authié, G.D. d'Ieteren and A.S. Peregrine, 1993. Epidemiology of bovine trypanosomiasis in the Ghibe valley, southwest Ethiopia. Tsetse challenge and its relationship to trypanosome prevalence in cattle. Acta Trop., 53: 121-134.