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Epidemiology of Trypanosomosis in Goats in Abelti, Bede and Ghibe Valley, South West Ethiopia

[1]Berhe Mekonnen, [1]Fikru Regassa and [2, 3]Abraha Gebregziabher Kahsay
[1]Department of Biomedical Sciences, College of Veterinary Medicine and Agriculture,
Addis Ababa University, P.O. Box 34, Hora Street, Debre Zeit, Ethiopia
[2]Department of Biomedical Sciences, School of Veterinary Medicine,
Wollo University, P.O. Box 1145, Dessie, Ethiopia
[3]Department of Biomedical Sciences, Institute of Tropical Medicine,
Nationalstraat 155, Antwerp, Belgium

Abstract: Results of this study indicated that trypanosomosis is potential a serious threat to the health and productivity of goats in the study areas. Blood samples from 435 goats of different site, agro-ecology, color, sex and age group were collected conveniently and examine with parasitological techniques. Among the goats examined, infection prevalence was found to be as 46 out of 435 goats (10.57%). Most of the infection were due to *T. congolense* (5.1%) followed *T. vivax* (2.5%), the rest was due to *T. brucei* (1.8%), mixed infection of *T. congolense* and *T. vivax* (0.7%) and *T. vivax* and *T. brucei* (0.5%). There was no statistically significant difference between sex, age, color, treatment status as well as and the trypanosome species with infection rates. Statistically significant difference was observed between agro-ecology ($\chi^2 = 5$, $p = 0.025$) and study site ($\chi^2 = 8.561$, $p = 0.014$) with infection rates. Finally, the study revealed that trypanosomosis in goats is an important disease in the study area and attentions should be given for the prospect of the disease in goats.

Key words: Agro-ecology, goats, prevalence, South West of Ethiopia, trypanosomosis

INTRODUCTION

In more recent years, tsetse flies have progressively invaded productive agricultural area in the West, South and South West part of Ethiopia. Consequently, it is estimated that a total area of 220,000 km^2 in the country is currently believed to be infested with different species of tsetse flies and livestock below 2000 m contour are exposed to various levels of trypanosomosis risk (NTTICC, 1996). As result, a total of 6.12 million sheep and goat are at risk of contracting trypanosomosis in Ethiopia (NTTICC, 2001).

Accordingly, the overall economic loss due to the disease was estimated to be between US$1,408 and 1,540 million annually (NTTICC, 1996). In addition, non-tsetse borne trypanosomosis has been also reported affected a considerable number of animal population in tsetse free zones of the country (MOA, 1995).

Tsetse transmitted trypanosomes of cattle are recognized as serious constraint to livestock productivity but the situation with regards to goat is less clear (Masiga, 1996). For many years, it was widely believed that goats are little affected by trypanosomosis (Griffin, 1978; Stephen, 1986). This could be substantiated by the report of Bealby *et al*. (1996) who indicated that goats survive low to medium tsetse challenge without any specific intervention to reduce or remove tsetse flies or the infections that they transmit.

However, there is no information available on the prevalence of trypanosome infection in goats in Ghibe, West Ethiopia and potential danger of these animals as reservoir of the disease is not assessed. The shortage of information and underestimation of trypanosomosis in goats could also be due to herding strategy of most livestock owners. In most of the herds, goats reared with cattle, however tsetse flies prefer cattle for their blood meal than goats. The scenario is thought to vary when goats are herded separately. In this study attempt was made and investigate the situation of caprine trypanosomosis when they are herded apart from cattle.

MATERIALS AND METHODS

Study area: The study was conducted in Abelti and Bede mid land and Ghibe Valley which is low land, South West of Ethiopia in collaboration with ILRI. It is situated 180 km

Corresponding Author: Abraha Gebregziabher Kahsay, Department of Biomedical Sciences, Institute of Tropical Medicine, Nationalstraat 155, Antwerp, Belgium

South West of Addis Ababa between latitude 8°00'-8°15'N and longitude 37°40'E (Reid *et al*., 2000) with altitude ranging between 1000 and 1400 masl. The climate is tropical with long rain season from late May to October and long dry season from December to February short rain and dry season are experienced in November and May, respectively. Annual rain fall is high and reliable (Reid *et al*., 2000) on average 1100 mm year $^{-1}$.

Study animals and design: The cross sectional study was conducted from November, 2010 to April, 2011 on 435 goats selected by conveniently sampling methods in Abelti and Bede of the mid land and Ghibe Valley of low land. Information on agro-ecology, area, treatment, sex and age of the animals were obtained from owners and infection rate revealed from collected blood samples was recorded. Goats <1 year old were categorized as young while those >1 year were classified as adult.

Blood sample collection and examination: The farmers were asked to bring their animals in to the convenient place of the survey sites a day before the commencement of sampling. The animals were chosen conveniently and blood samples from superficial ear-vein were taken. Small drop of blood was placed at one end of the clear microscopic slide. Another slide (spreader slide) was grasped at its edge and placed in front of the drop blood at an angle of approximately 45 degree and pushed back until it touches the drop. Then, thin blood smears were made, air dried, fixed with methanol for 5 min air dried put in to slide rack and travel for 5 h for submission to the parasitological laboratory. The slides were stained with Giemsa at 1:9 dilutions for 30 min, washed with distilled water and finally dried. The stained smears were examined under oil immersion. Trypanosome species identification was conducted from Giemsa stained thin smear using their morphology presence and absence of flagella, position of kinetoplast, presence of undulated membrane and overall size) (Murray *et al*., 1983).

Data collection and analysis: The data collected were stored in Microsoft Excel and analysis was done by SPSS Version 15. The infection rate in goats by agro-ecology, area, treatment, sex and age was analyzed by χ^2-test of statistical methods.

RESULTS

Prevalence of Trypanosomosis out of 435 goats examined, 46 (10.57%) were found positive for trypanosome using thin Smear Method. *Trypanosoma congolense*, *Trypanosoma vivax* and *Trypanosom abrucei* were the species identified.

The prevalence was highest at Bede (14.40%) followed by Abelti (6.26%) and Ghibe being (5.47%) indicating that the infection rate increased at the midland. A statistically significant difference ($p<0.05$) in the prevalence of the disease was observed among the three study areas (Table 1).

The species of trypanosome detected were *T. congolese* in twenty two goats (5.1%), *T. vivax* in eleven goats (2.5%), *T. brucei* in eight goats (1.8%), mixed infection of *T. congolense* and *T. vivax* in three goats (0.7%) and *T. vivax* and *T. brucei* were observed in two goats (0.5%). But the difference among the prevalence of different trypanosome species was not statistically significant (Table 2).

The infection rate was compared between the two age groups of the young and adult. The result showed that the prevalence was higher in young (13.17%) than in adults (8.96%). However, this difference was not statistically significant (Table 3).

The infection rate between sex groups showed 9.58% in females and 13.11% in male goats. Statistical analysis showed no significant difference between male and female goats (Table 4). The infection rate among the three dominant color of goats white, red and black showed higher prevalence in white (12.65%) followed by red (7.35%) and then black (11.28%). The difference was however not statistically difference (Table 5).

Table 1: Prevalence of goats trypanosomosis in the three sites in Ghibe, South West Ethiopia

Area	No. examined	No. negative	No. positive	Infected (%)
Abelti	64	60	4	6.25
Bede	243	208	35	14.40
Ghibe	128	121	7	5.47
Total	435	389	46	10.57

$\chi^2 = 8.561$, $p = 0.014$

Table 2: Relative frequencies of trypanosome species detected in the study area

Trypanosome species	Frequencies	Percentage
T. congolense	22	5.10
T. vivax	11	2.50
T. brucei	8	1.80
T. congolense and *T. vivax*	3	0.70
T. vivax and *T. brucei*	2	0.50
Total	46	10.57

Table 3: Prevalence of trypanosomosisin goats by age

Age groups	No. examined	No. negative	No. positive	Infected (%)
Young	167	145	22	13.17
Adult	268	244	24	8.96
Total	435	389	46	10.57

Table 4: Prevalence of trypanosomosis in goats by sex

Sex	No. examined	No. negative	No. positive	Infected (%)
Female	313	283	30	9.58
Male	122	106	16	13.11
Total	435	389	46	10.57

$p>0.05$

Table 5: Prevalence of trypanosomosis in goats on color basis

Colors	No. examined	No. negative	No. positive	Infected (%)
White	166	145	21	12.65
Red	136	126	10	7.35
Black	133	118	15	11.28
Total	435	389	46	10.57

$p>0.05$

Table 6: Prevalence of trypanosomosis in goat's onagro-ecology

Agro-ecology	No. examined	No. negative	No. positive	Infected (%)
Midland	307	268	39	12.70
Lowland	128	121	7	5.46
Total	435	435	46	10.57

$\chi^2 = 5$, $p \leq 0.025$

Table 7: Prevalence of trypanosomosis in goats based on the treatment status

Treatment status	No. examined	No. negative	No. positive	Infected (%)
Untreated	416	372	44	10.57
Treated	19	17	2	10.53
Total	435	389	46	10.57

When the prevalence of trypanosomosis was compared accordingly to the agro-ecology from which the animals were sampled, it was shown that the prevalence was higher in the mid altitude (12.70%) followed by low land (5.46%). The difference was statistically significant ($p<0.05$) (Table 6).

The prevalence of caprine trypanosomosis was 10.57% in goats treated with trypanocidal drugs (Berenil) while it was 10.53% in untreated goats. There was no difference in the prevalence of trypanosome infections whether the goats were treated or not. This was indicated by the absence of statistically significant difference ($p>0.05$) among the treated (10.57%) and untreated goats (10.53%) (Table 7).

DISCUSSION

Small ruminants represent a considerable investment as a bank system to many farmers for the supply of protein for human consumption and supply manure for field crops (Jordan, 1986). In Ethiopia they provide 46% of the value of national meat production and 58% of the value of hide and skin production which is the second most important source of agricultural export income after coffee (Kassahun *et al*., 1989). Small ruminants provide 12.5% of the value of livestock product consumed by the farmers and 48% of the cash income generated by livestock production though they represented only 6.6% of the capital invested in the form of livestock (Kassahun *et al*., 1989).

Despite these facts, little data is available on the prevalence of trypanosomosis in goats which limit their production in Ethiopia. The possible reasons for this include previous suggestion that goats appear to be less adversely affected by reduction in fodders availability due to drought and cattle are the preferred host for tsetse flies when herded together with goats. Tsetse flies find goats blood rather unpalatable and use them only when they are very hungry (Griffin, 1978; Opasina and Onyeka, 1982; Radostits *et al*., 2000; Stephen, 1986) and some difficulties to detect trypanosome infection because of the low parasitemia that occurs in goats (Bealby *et al*., 1996; Hendy, 1988).

In this study, an overall trypanosomosis prevalence of 10.57% was found in goats. This is different from the previous report of Bezabeh (1987) and Shukre (1995) in Ethiopia and Masiga (1996) in Nigeria who reported 5.37, 5.45 and 6%, respectively. The difference in the prevalence of caprine trypanosomosis between the current result and the previous could be due to variation in sample size, sampling methods, agro-climatic variation and herding strategies in the present study the goats included in the survey were herded separately from cattle so that tsetse flies might have no alternative to feed than goats' blood.

The animals had good body condition and there no clinical signs observed during research and this is in agreement with what has been reported by Nawath in West Africa under field condition and Osaer *et al*. (1994) and Snow *et al*. (1996) who indicated that goats are not often selected as asource of feeding by tsetse flies. Snow *et al*. (1996) also studied the grazing patterns of goats and it was observed that goats stay closer to the village. Mostly in fallow field and therefore, do not intrude as far as in into tsetse infested habitat as cattle do. Thus, they have less chance of being fed on by infested tsetse. Hence, those goats that are fed on by infected tsetse flies could serve as potential reservoir of infection for other animals.

The findings of the present research represent an overall infection rate of trypanosomoses in Ghibe valley, South West Ethiopia to be 10.57%. It was highest at the midland Bede (14.40%) followed by the midland Abelti (6.25%) and the low land Ghibe valley (5.47%). The variation in prevalence among the sites was statistically significant ($p<0.05$). The increased prevalence in this area might have been due to the fact that goats browse at the low land area and they are herded separately from the cattle.

There was no significant difference ($p>0.05$) in infection rate between the two sexes even though males had slightly higher infections rate (13.11%) than female (9.58%). The higher infection rate in male in this study agrees with the finding of Shukre (1995). The slightly lower infection rate in female might probably be due to the additional nutritional supplementation and cares given to the kidding females.

Resistance to trypanosome infection in young animals has been noted by Stephen (1986), Murray and Dexter (1988) and Bealby *et al.* (1996) who concluded that young goats are much more resistance than adult due to lack of long association of young animals with the vectors of trypanosomosis. However, the present study showed higher infection rate of 13.17% for young animals' age group considered in this research than 8.96% of older animals' age group. This is similar to that of Jininu (2005) 5.7% in young and 5.1% in older and Shukre (1995) 5.6% in young and 5.3% in older which is different from Dinka and Abebe (2005).

The present prevalence rate among different goats coat color did not show statistically significant difference. The infection rate among the white goats is the highest and followed by black and red (12.65, 11.28 and 7.35%), respectively. However, former studies conducted to study coat color to their attractiveness to tsetse species revealed that black and red color have been found to be more attractive but the strongest landing responses were found to be on black surface (Green, 1993; Leta and Mesesle, 2010).

T. congolense and *T. vivax* were found to be the major trypanosome species responsible for the infection in goats. Their relative frequency was *T. congolense* (5.1%) and *T. vivax* (2.5%). A higher proportion of *T. congolense* has also been seen in the previous research of Dinka and Abebe (2005). Langrige indicated that high infection with *T. congolese* coincides with the prevalence of savannah type tsetse species which is in agreement with current findings reported in this document.

*T. vivax*is found to be the second most important trypanosome species responsible for goats' trypanosomosis unlike *T. congolense* and *T. brucei* which could only be transmitted cyclically by tsetse fly, *T. vivax* can be transmitted by other biting flies and infect hosts in tsetse free areas. This suggests that in the study site both cyclicand mechanical transmission of trypanosomosis occur in goats.

The parasitemic level due to *T. brucei* group inside animals is generally lower than the other two species. This could be explained by the species characteristics that it can periodically dis appear from circulating blood and the parasite being tissue dwellers which reduce the possibility to observe in the blood smear.

CONCLUSION

The results of questionnaire survey conducted in all study sites suggested that the highest incidence of animal trypanosomosis was found to be just after the long and short rain seasons. This is because during these seasons both mechanical and cyclical vectors of trypanosomosis become abundant. The same reasoning was both reported by Tewolde (2001) and Mengiste (1999). According to the present result, the farmers get their animals treated by untrained personnel or by themselves and the share of veterinary professional are minimal.

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REFERENCES

Bealby, K.A., R.J. Connor and G.J. Rowlands, 1996. Trypanosomosis in Goats in Zambia. ILRI (aka ILCA and ILRAD), Kenya, ISBN: 9789291460083, Pages: 88.

Bezabeh, G., 1987. Prevalence of trypanosomosis in small ruminants in Arbaminch. DVM Thesis, Faculty of Veterinary Medicine, Addis Ababa University.

Dinka, H. and G. Abebe, 2005. Small ruminants trypanosomosis in the southwest of Ethiopia. Small Rumin. Res., 57: 239-243.

Green, C.H., 1993. The effects of odours and target colour on landing responses of *Glossina morsitans morsitans* and G. *pallidipes* (Diptera: Glossinidae). Bull. Entomol. Res., 83: 553-562.

Griffin, L., 1978. African trypanosomiasis in sheep and goats: A review. Vet. Bull., 48: 819-824.

Hendy, C., 1988. The Effect of Trypanosomosis Prophylaxis and Anthelmintic Treatment in Goats under Traditional Management in Southern Tanzania. In: Livestock Production in Tsetse Affected Areas of Africa: Proceedings of a Meeting Held in Nairobi, ILCA/ILRAD (Eds.). ILRI (aka ILCA and ILRAD), Kenya, ISBN: 9789290552888, pp: 289-309.

Jininu, J., 2005. Small ruminants Trypanosomosis in and around mizanteferi, benchmaji zone, SNNPR, Ethiopia. DVM Thesis, Faculty of Veterinary Medicine, Addis Ababa University, Addis Ababa Ethiopia.

Jordan, A.M., 1986. Trypanosomiasis Control and African Rural Development. Longman Group Ltd, Harlow and New York, pp: 45-49.

Kassahun, A., G. Getachew, A. Zelealem, A. Negusie and F. Ian, 1989. Small ruminants production in Ethiopia: Constrains and future prospect. Proceedings of the 3rd National Livestock Improvement Conference, May 24-26, 1989, IAR, Addis Ababa, pp: 37-45.

Leta, S. and F. Mesesle, 2 010. Prevalence of small ruminant trypanosomosis and tsetse fly challenge in upper didessa valley, Ethiopia. Global Veterinaria, 5: 215-219.

MOA, 1995. Ruminant livestock development strategy. Museum of Anthropology, Addis Ababa, Ethiopia, pp: 56-79.

Masiga, K., 1996. Trypanosomosis in small ruminants in Kenya. International Foundation for Science, Stockholm (Sweden) Parasitological Research in Africa, pp: 79-85.

Mengiste, B., 1999. Study on prevalence of bovine trypanosomosis and assessment of drug resistance in Ghibe valley, South West Ethiopia. DVM. Thesis, Addis Ababa University, Debre Zeit, Ethiopia.

Murray, M. and M. Dexter, 1988. Anemia in boven Africa trypanosomosis. Acta Tropica, 45: 389-432.

Murray, M., M. Trail, A. Turner and Y. Wissocq, 1983. Livestock Productivity and Trypanotolerance: Net Work Training Manual. ILCA, Addis Ababa, Ethiopia, pp: 4-10.

NTTICC, 1996. Annual report ministry of agriculture. NTTICC, Bedelle, Ethiopia.

NTTICC, 2001. Annual report ministry of agriculture. NTTICC, Bedelle, Ethiopia.

Opasina, B.A. and E.C. Onyeka, 1982. Preliminary report on the incidence of trypanosomiasis in West African dwarf sheep and goats in southwest Nigeria. Bull. Anim. Health Prod. Afr., 30: 263-264.

Osaer, S., B. Goossens, D.J. Clifford, S. Kora and M. Kassama, 1994. A comparison of the susceptibility of Djallonke sheep and West African Dwarf goats to experimental infection with two different strains of Trypanosoma congolense. Vet. Parasitol., 51: 191-204.

Radostits, O.M., C.C. Gay, D.C. Blood and K.W. Hinchcliff, 2000. Disease Caused by Trypanosomes. In: Veterinary Medicine: A Textbook of the Diseases of Cattle, Sheep, Pigs, Goats and Horses, Radostits, O.M., C.C. Gay, D.C. Blood and K.W. Hinchcliff (Eds.). 9th Edn., WB Sounders Co. Ltd., New York, pp: 1329-1337.

Reid, R.S., R.L. Kruska, N. Muthui, A. Taye and S. Wotton, C.J. Wilson and W. Mulatu, 2000. Land-use and land-cover dynamics in response to changes in climatic, biological and socio-political forces: The case of Southwestern Ethiopia. Landscape Ecol., 15: 339-355.

Shukre, M., 1995. Prevalence of trypanosomosis in small ruminants. DVM Thesis, Faculty of Veterinary Medicine, Addis Ababa University, Ethiopia.

Snow, W.F., T.J. Wacher and P. Rawlings, 1996. Observations on the prevalence of trypanosomosis in small ruminants, equines and cattle, in relation to tsetse challenge, in The Gambia. Vet. Parasitol., 66: 1-11.

Stephen, L.E., 1986. Trypanosomiasis: A Veterinary Perspective. Pergamon Press, Oxford, UK., pp: 123-231.

Tewolde, N., 2001. Study on the occurrence of drug resistance trypanosomosis in cattle farming in tsetse control area (FLTCA) project in western Ethiopia. M.Sc. Thesis, Addis Ababa University, Ethiopia.