African Journal of Biomedical Research, Vol. 10 (2007); 67 - 72
ISSN 1119 – 5096 © Ibadan Biomedical Communications Group

Full-text available at
www.ajbrui.com
www.bioline.br/md
www.ajol.com

Full Length Research Article

Prevalence of Trypanosome Infections in Ruminants in the Southern Guinea Savanna, Nigeria.

A. B. Ahmed[1], S.N. Okiwelu[2] and P. M. Dede[3]

[1] *Faculty of Science, Department of Biological Sciences, Kaduna State University, PMB 2339, Kaduna, Nigeria.*
[2]*Department of Animal & Environmental Biology, University of Port Harcourt,Rivers State, Nigeria.*
[3] *Vector and Parasitology Department, Nigerian Institute for Trypanosomiais Research, P. M. B. 03, Vom, Plateau State.*

ABSTRACT

A survey was conducted to determine the prevalence of trypanosomes in cattle and sheep in Kaura Local Government Area (LGA) of Kaduna State, southern guinea savanna, Nigeria. Animals were sampled in 12 villages from the districts of Bondong, Fada, Kadarko, Kukum, Manchok and Zankan. Sampling visits were undertaken on seasonal basis in the late wet season (October), early dry season (December), late dry season (February) and early wet season (June). Three- ml blood samples were collected from the jugular vein of 395 cattle and 37 sheep. The results revealed that 21.53 ± 1.97% (range 9.4-43.8% per village) of the total animals were infected with various species of trypanosomes, with the prevalence in bovine and ovine being 20.51 ± 2.03% and 32.43 ± 7.69% respectively. *Trypanosoma vivax* had the highest infection rates (64.52%), followed by *T. brucei* (18.30%) and *T. congolense* (17.20%). Infections varied significantly among the districts, ranging from 9.7% at Zankan to 36.9% at Manchok ($t=13.08$; $df=3$; $p<0.05$; p-value=0.001). Infections were significantly higher in the early dry season compared to the other sub-seasons ($t=5.12$; $df=5$; $p<0.05$; p-value=0.004). Thirty three percent of the 12 villages screened had low prevalence figures (0-20%) while the remaining had high figures up to 40%. From the figures obtained, it appears that infections with trypanosomes are highly prevalent in cattle and sheep in Kaura LGA and may be a serious constraint to profitable livestock production in the area. The need to develop an effective control/eradication programme against the disease to boost the poverty eradication programme of the Federal Government is recommended
(Afr. J. Biomed. Res. 10: 67 - 72, January 2007)

Keywords: *Trypanosomes, Prevalence, Guinea Savannah, Nigeria, ruminants*

**Address for Correspondence : Dr. A. B. Ahmed, Department of Biological Sciences, Kaduna State University, PMB 2339, Kaduna, Nigeria, (email: adoahmed2001 @yahoo. com)*

Received:
July, 2006

Accepted (Revised):
December, 2006

Published
January, 2007

Abstracted by:
African Index Medicus (WHO), CAB Abstracts, Global Health Abstracts, Asian Science Index, Index Veterinarius,

INTRODUCTION

Animal trypanosomiasis is a disease complex caused by protozoa in the genus *Trypanosoma* which develops cyclically in the vector, the tsetse-fly. It is ranked the fourth most important disease of cattle in Nigeria after rinderpest, contagious bovine pleuropneumonia (CBPP) and dermatophilosis (streptothricosis) (Ademosun, 1973).

The disease is highly endemic in many areas in the country. Surveys of North central Nigeria conducted between 1989-1991, showed a disease prevalence of 4.3% in cattle while later studies (1993-1996) showed an increased prevalence of 10.6% (Onyiah, 1997). In the southern guinea/derived savannah regions, prevalences of 6.7% and 2.7% were recorded in Bendel and Ogun states (Ikede *et al.,* 1987). Other prevalences are 1.5% for the montane vegetation (Anene & Ezekwe, 1995) and 44% recorded among imported Friesian cattle breeds in the forest zone (Jibike *et al.,* 1995). A lower rate of 5% was obtained on the high plateaux of Jos, Mambilla and Obudu, areas previoulsly reported to be tsetse-free (Anene *et al.,* 1991, Anosa, *et al.,* 1993, Dede *et al.,* 1996).

In this paper, we examine the prevalence rate of trypanosome infections in ruminants in pasture-rich Kaura Local Government Area (LGA) of Kaduna State as a way of identifying priority areas to be targeted by the proposed extensive eradication programme of the Pan African Tsetse and Trypanosomiasis Eradication Campaign (PATTEC). The presence of high population of Fulani pastoralists, most of whom have resided in the area for several decades makes the area a high priority for control, both to the stockmen, local authorities and the Federal Government. This is justified because the tsetse-infested area in Nigeria is large, trypanosome infections in animals is widespread and available resources and capacity so limited, that prioritisation of intervention areas is important.

MATERIALS AND METHODS

Study Area

Details of the study area have been described (Ahmed, 2003). Cattle and sheep were sampled for trypanosomes in 12 villages from the districts of Bondong, Fada, Kadarko, Kukum, Manchok and Zankan within the LGA (Fig. 1).

Screening and Diagnosis of Infections in Livestock

The cattle investigated were mainly local zebu or Bunaji breeds (Gates, 1952) while the sheep were the Yankassa breed (Mason, 1951), both of which are the common breeds in the area. In each of the six districts, four visits were undertaken on a seasonal basis in the following sequence: once in the late wet season (October 2000), early dry season (December 2000), late dry season (February 2001) and early wet season (June 2001).

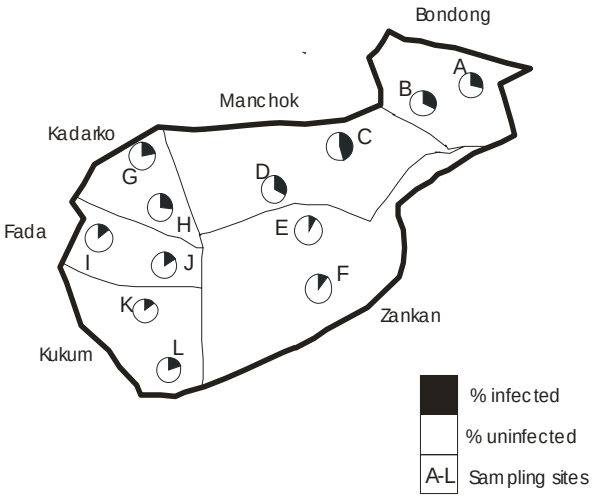

Fig. 1
Map of Kaura Local Government Area showing the districts, location of the sampling sites and prevalence rates

Three ml-blood samples were collected from the jugular vein of each animal and placed into bottles containing EDTA as anticoagulant. The

samples were stored in cool boxes and examined approximately 2 hr later using the Haematocrit Centrifugation Technique (HCT) (Woo, 1970) and the Buffy Coat Method (BCM) (Murray *et al.,* 1977). Giemsa-stained thin film was used for morphological differentiation of trypanosome species (Hoare, 1972, Schalm *et al.,* 1975).

RESULTS

A total of 395 cattle and 37 sheep of various ages were investigated during the survey. The results reveal that 21.53 ± 1.97% (range 9.4-43.8% per village) of the total animals were infected with various species of trypanosomes (Table 1 and Fig. 1). Of this, 20.51 ± 2.03% (81/395) occurred in bovines and 32.43 ± 7.69% (12/37) in ovines (Tables 2 & 3). For both animal groups, infections

A total of 395 cattle and 37 sheep of various ages were investigated during the survey. The results reveal that 21.53 ± 1.97% (range 9.4-43.8% per village) of the total animals were infected with various species of trypanosomes (Table 1 and Fig. 1). Of this, 20.51 ± 2.03% (81/395) occurred in bovines and 32.43 ± 7.69% (12/37) in ovines (Tables 2 & 3). For both animal groups, infections due to the *T. vivax, T. brucei* and *T. congolense* were 64.52% (60/93), 18.30% (17/93) and 17.20% (16/93) respectively (Table 1). Infections varied significantly among the districts, ranging from 9.7% at Zankan to 36.9% at Manchok (t=13.08; DF=3; p<0.05; P-value= 0.001). Infection rates were significantly higher in the early dry season compared to the other seasons (t=5.12; df=5; P<0.05; P-value=0.004) (Table 4).

TABLE 1:
Prevalence of trypanosome infection in ruminants across the six districts

Location Number*	District/Village	No. Sampled	No. Infected(%)	Trypanosome species(%)		
				T. vivax	*T. congo*	*T. brucei*
	Bondong					
A	Chori	32	9(28.1)	6(66.7)	2(22.2)	1(11.1)
B	U/Shemang	38	12(31.6)	10(83.3)	2(16.7)	0(0)
	Manchok					
C	Gizagwai	32	14(43.8)	9(64.3)	2(14.3)	3(21.4)
D	Asu	33	10(30.3)	6(60.0)	1(10.0)	3(30.0)
	Zankan					
E	Ashim	32	3(9.4)	3(100.0)	0(0)	0(0)
F	Zilang	40	4(10.0)	2(50.0)	1(25.0)	1(25.0)
	Kadarko					
G	Tum	37	10(27.0)	7(70.0)	3(30.0)	0(0)
H	Malagum	40	9(22.5)	6(66.7)	1(11.1)	2(22.2)
	Fada					
I	F/Daji	31	5(16.1)	3(60.0)	1(20.0)	1(20.0)
J	Kpak	30	5(16.7)	1(20.0)	2(40.0)	2(40.0)
	Kukum					
K	K/Daji	38	5(13.2)	3(60.0)	1(20.0)	1(20.0)
L	Agbam	49	7(14.3)	4(57.1)	1(14.3)	2(28.6)
TOTAL		**432**	**93(21.5)**	**60(64.5)**	**17(18.3)**	**16(17.2)**

*See Fig. 1 for location of sampling sites

TABLE 2:
Seasonal distribution of trypanosome species among bovines

Season	Sex	No. examined	No +ve (%)	Trypanosome species(%)		
				Tv	*Tc*	*Tb*
Wet	Male	71	13(18.3)	9(69.2)	3(23.1)	1(7.7)
	Female	168	29(17.3)	20(69.0)	5(17.2)	4(13.8)
Dry	Male	49	10(20.4)	7(70.0)	1(10.0)	2(20.0)
	Female	107	29(27.1)	18(62.1)	4(13.8)	7(24.1)
Total		**395**	**81(20.5)**	**54(66.7)**	**13(16.0**	**14(17.3)**

Tv= *T. vivax*; Tc= *T. congolense*; Tb= *T. brucei* subspecies

TABLE 3.
Seasonal distribution of trypanosome species among ovines

Season	**Sex**	**No. examined**	**No +ve (%)**	**Trypanosome species(%)**		
				Tv	*Tc*	*Tb*
Late wet	Male	6	1(16.7)	0(0)	1(100.0)	0(0)
	Female	31	11(35.5)	6(54.5)	2(18.2)	3(27.3)
Total		**37**	**12(32.4)**	**6(50.0)**	**3(25.0)**	**3(25.0)**

Tv= *T. vivax*; Tc= *T. congolense*; Tb= *T. brucei* subspecies

TABLE 4:
Seasonal variation of trypanosome species in ruminants

Season	No. examined	Trypanosome species (%)			**Total (%) +ve**
		T. vivax	T. congolense	T. brucei	
Early dry	69	11	3	3	**16(24.6)**
Late dry	87	14	3	5	**22(25.3)**
Early wet	173	21	6	5	**32(18.5)**
Late wet	103	14	4	4	**22(21.4)**
Total	**432**	**60**	**16**	**17**	**93(21.53)**

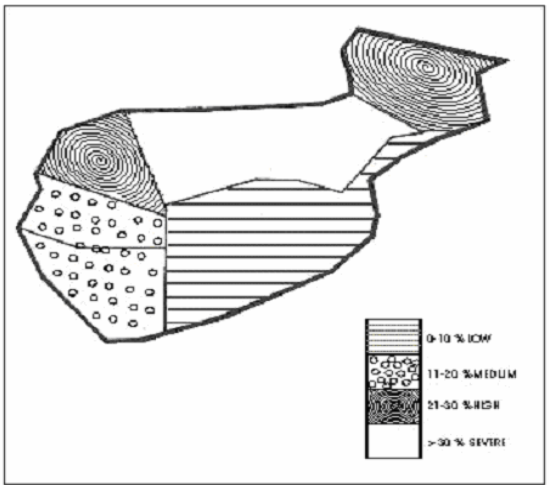

Fig. 2.
Mean infections of ruminants with trypanosomes within Kaura LGA

DISCUSSION

The prevalence of 21.5% recorded during this study portrays the LGA as a high-risk zone. The alarming higher prevalence earlier reported by Maikaje (Maikaje, 1998) was probably because his investigations were conducted shortly after a devastating trypanosomiasis outbreak and the animals were still recovering from the effects.

The preponderance of *T. vivax* in the animals screened in this study, compare favourably with earlier observations in the Northern Guinea savanna zone (Ahmed & Ndifon, 1993, Kalu & Lawani, 1996) and other parts of Africa Bengaly *et al.,* 1999). The dominance of this group of trypanosomes may be due to one or both of

the following reasons: the simplicity and short duration of the life cycle of the parasite in the vector compared to those of *congolense* and *brucei* groups (Itard, 1989) and its potential as an agent for mechanical transmission by biting insects (Wells, 1972), of which fifteen species have been recorded in the study area (Ahmed *et al.*, 2005).

Because of the seriousness of the problem in the area, the pastoralists are forced to adopt various measures to address it, including the use of prophylactic and curative drugs as well as practicing a form of animal husbandry of moving their stock from the lowlands to the tops of hills during the wet season to avoid tsetse-animal contact (Maikaje, 1998, Ahmed, 2003). Clearly, no serious effort has been directed at the vector. The drugs commonly used are Berenil® (1, 3 bis (4-aminodinophenyl triazene)) and Samorin® (isometamedium chloride) which may have been suppressing the disease below outbreak thresholds most of the time, portraying a false picture of safety. Although studies on cyclical transmission of trypanosomes under the influence of residual drugs or antibody has received only minimal attention, there is evidence that several drug-resistant strains of trypanosomes are circulating in the study area (Maikaje, 1998), which may not be unconnected to the uncontrolled use of drugs by the stockmen. Stephen (1963) showed experimentally that *G. p. palpalis,* the same tsetse species present in the area is an efficient transmitter of drug-resistant strains of trypanosomes, with such resistant strains retaining their resistance to the specific drugs under consideration when they are subsequently transmitted cyclically by the fly (Gray & Roberts, 1971). The situation clearly shows that chemotherapy, to the exclusion of other approaches is not adequate to manage the problem in the area. A successful solution to the nagana problem would appear to require a sustained, planned integrated approach of using prophylactic and curative drugs, simultaneously with vector eradication. When planning the vector control component, in addition to planning for the cyclical tsetse vectors, attention should also be given to the numerous species of other biting insects present in the area that may have been transmitting the trypanosome parasites mechanically. These groups of insects are usually neglected when planning trypanosomiasis control/eradication campaigns despite the significant role they play in the epidemiology of the disease.

A valid conclusion that can be drawn from this work is that, in general, the LGA can be considered to present three epidemiological patterns, each of which may require different levels of control/eradication inputs (Figs. 2):

1. Region of high/severe endemicity at Bondong, Manchok and Kadarko districts in the northwest and north east.
2. A region of medium prevalence at Fada and Kukum districts in the north-west.
3. A region of low prevalence in the mountain ranges of Zankan district in the south-east

Over the years, the uncontrolled use of prophylactic and curative drugs and the practice of moving herds from the lowlands to the tops of Kagoro and Attakhar hills during the wet seasons (Maikaje, 1998, Ahmed, 2003) have failed to produce lasting solution to the problem. It is suggested that a successful solution to the nagana problem would appear to be the use of a well coordinated treatment regime and a simultaneous planned area-wide eradication of the tsetse in the entire area as well as the numerous species of other biting dipterans that may be worsening the situation by acting as mechanical transmitters.

REFERENCES

Ademosun, A. A. (1973). The development of the livestock industry in Nigeria: Ruminants'. Proceedings of Agricultural Society of Nigeria. 10:13-20.

Ahmed, A. B. (2003). Population ecology of *Glossina palpalis palpalis* Robineau-Desvoidy (Diptera: Glossinidae) in relation to animal trypanosomiasis in Southern Guinea Savanna, Nigeria, Ph.D Dissertation University of Port Harcourt, Nigeria, 378 pp.

Ahmed, A. B. and Ndifon, G. T. (1993). Blood parasites of ruminants in Kano State, northern Nigeria. Nigerian Journal of Parasitology, 13:19-21. **Ahmed, A. B., Okiwelu, S. N. and Samdi, S. M. (2005).**

Species diversity, abundance and seasonal occurrence of some biting flies in southern Kaduna, Nigeria. African Journal of Biomedical Research, Vol. 8: 113 - 118

Anene, B. M, and Ezekwe, A. G. (1995). Trypanosomosis in intensively reared Muturu calves in Nigeria. Tropical Animal Health and Production 27(4):229-230.

Anene, B. M., Chima, A. B., Jibike, G. I., and Anika, S. M. (1991). Prevalence of trypanosomiasis in Zebu at Obudu ranch - a tsetse free zone in Nigeria. Preventive Veterinary Medicine 10 (4): 257-260

Anosa, V. O., Anitia, R. E., Ohore, O. G., Agbede, R. I. S., Anika, S. M., Lawani, F., Ogunsusi, R., and Okoro, H. O. (1993). Prevalence of trypanosomiasis in ruminants in southwestern Nigeria as determined by parasitological and antigen Elisa methods. OAU/STRC 22nd meeting, Kampala, Uganda. Publ. No. 117. **Bengaly, Z. Ganaba, R., Sidibe, I. and Duvallet, G. (1999).** Prevalence of bovine trypanosomiasis in the south Sudanese zone of Burkina Faso. In OAU/STRC (Abstarct only).

Dede, P. M., Omoogun, G. A., Uzoigwe, N. R., Njoku, C. I., Daniel, A. D., Daddah, A. J. and Ajagbonna, B. O. (1996). Evaluation of tsetse and trypanosomiasis situation on the Jos Plateau, a tsetse free zone in central Nigeria. 27th Annual Scientific Conference of the Entomological Society of Nigeria (ESN), Port Harcourt, 7-10th October, 1996.

Gates, G. M. (1952). Breeds of cattle found in Nigeria. Farm & forest II:19-43

Gray, A. R. and Roberts, C. J. (1971). The cyclical transmission of strains of *Trypanosoma congolense* and *T.vivax* resistant to normal therapeutic dose of trypanocidal drugs. Parasitology, 63:67.

Hoare, C. A. (1972). The trypanosomes of mammals. A zoological monograpgh. Blackwel Scientific Publication Oxford & Edingburgh.

Ikede, B. O., Renolds, L., Ogunsanmi, A. O., Fawumi, M. K., Ekwuruke, J. O. and Taiwo, V. O. (1987). The epizootiology of bovine trypanosomiasis in the derived savanna zones of Nigeria: a preliminary report. Paper presented at the 19th meeting of the ISCTRC, Lome , Togo, March 3oth-April 3rd, 1987.

Itard, J. (1989). African animal trypanosomiasis. In M. Shah-Fischer & Ralph Say, R. (English translators). Manual of Tropical Veterinary Parasitology. CAB International, UK. Pp 199-292.

Jibike, G. I., Anene, B. M., Onyekwendiri, E. O., Chima, B. A. and Anika, S. M. (1995). Rainy season prevalence of bovine trypanosomiasis in south-eastern Nigeria. Journal of the Pausteur Institute (Romania) 3:93- 102.

Kalu, A. U. and Lawani, F. A. G. (1996). Observations on the epidemiology of ruminant trypanosomiasis in Kano State, Nigeria. Revue Elevage Medicine Pays Tropicaux