

Epidemiology of Trypanosomiasis in Derived Savannah of Nigeria

¹A. Abubakar*, ²H. M Sabo, ³S. Abdulkadir, ³S. N. Halliru ⁴R. B. Umar, ⁵D.A. Abdulkadir,

¹Nigerian Institute for Trypanosomiasis Research P.M.B. 2077, Kano state Liaison office,

²Department of Trypanosomiasis Research Kaduna P.M.B. 2077 Kaduna state.

³Biology Department Saadatu Rimi college of Education, P.M.B 3218 kumbotso, Kano state.

⁴Intergrated Science Department Saadatu Rimi college of Education, P.M.B 3218 kumbotso, Kano state.

⁵Nigerian Institute for Trypanosomiasis Research P.M.B. 2077, Ibadan, Oyo State Liaison office

Abstract: Bovine (cattle) trypanosomiasis, an important protozoan disease caused by the genus *Trypanosoma* is transmitted through bites by different species of *Glossina* and mechanically by a number of biting flies such as *Tabanus* and *Stomoxys* sp. Bovine trypanosomiasis and its vectors (*Glossina* species) occur in vast areas of the sub-Saharan Africa with devastating impact on livestock productivity posing a serious threat to the lives and livelihood of entire communities and constitutes the greatest single constraint to livestock and crop production thereby directly contributing to hunger, poverty, protein malnutrition and suffering of entire communities in Africa. Parasitological evaluation of bovine trypanosomiasis to assess its impact in 113 cattle from Ogunola, Olodo, and Imeko in derived savanna areas of Ogun State were carried out. Blood samples were collected aseptically and screened using standard trypanosome detection methods in addition to packed cell volume (PCV) determination. Results showed that mean prevalence rate of bovine trypanosomiasis was 31.62% with varying prevalence across the communities Olodo (42.85%), Ogunola (39.13%) and Imeko (13.33%) The common breeds identified were the red Bororo (37.6%), Sokoto Gudali (25.6%) and the white Fulani (36.8%). The white Fulani had higher infection status (18.8%) than the Gudali (9.8%) and Red bororo (3%). The high rate of *T. vivax* and the zoonotic nature of *T. b. brucei* call for urgent control action for humans and cattle.

I. Introduction

Trypanosomiasis continues to be a menace in the livestock industry in Nigeria despite the age long attempts to control the disease. The disease has received attention more in organized farms than in domestic and peridomestic animals. However, apart from the organized fulanis, government and some large individual farms, the majority of Nigerian livestock are kept within or around homestead. It is therefore very important to intensify surveillance and treatment of trypanosomiasis in these animals as well as in those that are reared primarily outside the human settlement. The Benue State of Nigeria falls within the derived savanna region (8°E-10°E and 6°N-8°N), where there is perennial feed for livestock. The state is known to be an endemic zone for both animal and human trypanosomiasis (1). Gboko Local Government Area (LGA) of Benue State, which is to the north of Konshisha LGA, was hyper-zoonotic for animal trypanosomiasis with a ruminant infection rate of 33.2% (2). Konshisha LGA is in the southern Guinea Savanna vegetation of Benue State. This area is suitable for rearing animals all year round. Despite the resultant negative effects of trypanosomiasis on the animal population (3) and the possible zoonotic nature of the disease (4), domestic and peridomestic stock are the main livestock holding of Konshisha LGA. It is therefore important that active surveillance be carried out on such domestic and peridomestic animals. A survey was therefore undertaken in the Konshisha LGA of Benue State to ascertain the state of trypanosomiasis in these animals. Bovine (cattle) trypanosomiasis, an important protozoan disease caused by the genus *Trypanosoma* is transmitted through bites by different species of *Glossina* and mechanically by a number of biting flies such as *Tabanus* and *Stomoxys* sp. (8) It is characterized by intermittent fever, parasitaemia, anaemia, lymphadenopathy, jaundice, progressive emaciation, weakness, and reduced productivity (1). It is a disease complex caused by one or more pathogenic species of trypanosomes such as *Trypanosoma vivax*, *Trypanosoma congolense*, and *Trypanosoma brucei brucei*. Bovine trypanosomiasis and its vectors (*Glossina* species) occur in vast areas of the sub-Saharan Africa with devastating impact on livestock productivity posing a serious threat to the lives and livelihood of entire communities and constitutes the greatest single constraint to livestock and crop production thereby directly contributing to hunger, poverty, protein malnutrition and suffering of entire communities in Africa. These problems are classified as severe in the majority of the 37 sub-Saharan countries affected where they rank among the first three (3) priorities of veterinary reportable diseases. Of the 165 million cattle found in Africa, only 10 million are found within the Tsetse fly free belt, and these are mostly low producing breeds which are maintained on high drug management regimes to keep trypanosomiasis at bay (5). Africa, as estimated by FAO, loses over 3 million cattle and other domestic livestock through deaths caused by trypanosomiasis every year (10). In Ogun State a fast growing

derived savannah region, information on bovine trypanosomiasis remained scanty and considering the emphasis on food security and agriculture, it became imperative to evaluate and assess the prevalence of Livestock is an integral part of the economies of most sub-Saharan African countries. For the region as a whole, livestock constituted 8% of the total GDP and 25% of the agricultural GDP in 1988. If the values of intermediate products such as traction and manure are included, livestock's share of the agricultural GDP might amount to 35% (4). The incidence, functions and relative importance of different types of livestock vary across countries and agroecological zones. The incidence of tsetse flies and trypanosomiasis has been the single most significant determinant of the distribution of livestock across ecological zones. The main focus of this paper is the humid zone, consisting of rain forests and derived savannas located mainly in central and West Africa. The humid zone has been generally considered as unsuitable for livestock production owing to high tsetse infestation levels (9). However, recent events, both natural and manmade, have made situations in the zone more complex for livestock production. An increasing number of transhuman cattle rearers from the northern sub-humid and semi-arid zones are settling in the humid zone and carrying out crop livestock mixed farming. Local crop farmers are gradually including livestock in their farming system. Consequently, production, consumption, marketing and the life pattern of these farmers are contributing to the evolution of a new farming system in the zone. This paper aimed to assess the present status of livestock and livestock production systems in the zone, and the potential of the evolving crop livestock farming system, in the light of local information and historical evidence from elsewhere in the world. A further objective is to enumerate research needs and priorities to facilitate the development of the evolving system. Human African trypanosomiasis, also known as sleeping sickness, is a vector-borne parasitic disease. It is caused by infection with protozoan parasites belonging to the genus *Trypanosom*. They are transmitted to humans by tsetse fly (*Glossina* genus) bites which have acquired their infection from human beings or from animals harbouring the human pathogenic parasites(5).

Tsetse flies are found just in sub-Saharan Africa though only certain species transmit the disease. For reasons that are so far unexplained, there are many regions where tsetse flies are found, but sleeping sickness is not. Rural populations living in regions where transmission occurs and which depend on agriculture, fishing, animal husbandry or hunting are the most exposed to the tsetse fly and therefore to the disease. The disease develops in areas ranging from a single village to an entire region. Within an infected area, the intensity of the disease can vary from one village to the next.

II. Epidemiology

Epidemiology is the study of disease origin and medical study of the causes the transmission of disease and its spread within a population.(encarter dictionary)

History of Discovery

Although the symptoms of African sleeping sickness were documented by (7), the association of the clinical syndrome with its etiological agent, the trypanosome was not documented until 1902 by Forde in the journal of tropical medicine. Forde chronicles his treatment of a 42 year old European male colonialist who complained of fever and malaise, leading Forde to make a preliminary diagnosis of malaria. Days later the patient's condition had not improved, slides of the patient's blood were prepared. The examination ruled out malaria due to lack of malarial parasites in the blood. Later Dutton, a second physician from Liverpool school of tropical medicine made the identification of trypanosome brucei in the patient's blood due to the probable location of the patient's inoculation, this case can be attributed to the species of *T.b gambiense*. The identification of *T.b rhodensiense* as another species of trypanosome to cause sleeping sickness was not documented until 1910. Stephens & Fantham described a strain of trypanosome observed in a blood smear of a patient who presented symptoms of African trypanosomiasis, the patient had no history of travel within a region known to be endemic with *T. brucei*, yet his blood smear clearly indicated a trypanosomal infection. The novel morphology was believed to be a new species of *T. brucei* because the patient was believed to have been infected in Rhodesia (present day Zimbabwe) the new parasite was thus named *T.b rhodensiense*. Tsetse vectors of Rhodesian and Gambian Sleeping Sickness The savanna vectors *G. morsitans* and *G. palidipes* are responsible for the transmission of *T. rhodensiense* in East Africa, while the principal vectors of west African sleeping sickness are *G. palpalis*, *G. fuscipes* and *G. tachinoides*.

Epidemiology of Trypanosomiasis In The Derived Savannah Zone Of Nigeria

Cattle movement into the derived savanna of southeast Nigeria is a relatively recent phenomenon compared with that in the southwest, yet estimates by (1) and (2) suggest a rapidly increasing process of sedentarization. Such increases in cattle numbers can be explained by a significantly low incidence of trypanosomiasis and its vector tsetse flies. Field studies among sedentary cattle in five states of southwest Nigeria found an overall infection rate of 14.4% with variation from 2.7 to 28.2% between states (3). In a survey of 52 cattle farmers in southwest Nigeria in 1990, the incidence of trypanosomiasis was mentioned by only 6%

of the respondents (5). In the southeast, (7) recorded similar incidence and infection rates among sedentary cattle. These studies concluded that trypanosomiasis was not a major problem for Zebu cattle production in the derived savanna zone, although protection against the disease was necessary. Moreover, with good husbandry and feeding, Zebu cattle acquired, through natural selection, some degree of trypanotolerance.

III. Methodology

The paper aimed to assess the present status of livestock and livestock production systems in the zone, and the potential of the evolving crop livestock farming system 113 cattle from Ogunola, Olodo, and Imeko in derived savanna areas of Ogun State were carried out. Blood samples were collected aseptically and screened using standard trypanosome detection methods in addition to packed cell volume (PCV) determination.

IV. Result

Table 1 Ecological zones and trypanosome infection rates in southwestern Nigeria.

Ecological zones	No. of samples	Positive cases		Trypanosome species		Glossina species		Biting flies		
		No/	%	T. congolense	T. vivax	G. palpalis	G. tachnoides	Crysops	Tabanids	Hippobosca
Derived savanna	672	133	19.8 ^a	81	52	8	16	20	5	120
Rain forest	181	12	6.6 ^b	10	2	3	3	68	18	200
Total	853	145	17.0	91	54	11	19	88	24	320

Table 2 Prevalence and mean PCV (%) of different breeds of trypanosome- infected and non infected cattle in southwestern Nigeria.

Breed	Prevalence Rate (%)	No. of samples	DRY SEASON				WET SEASON				
			Positive cases		Negative cases		No. of cases	Positive cases		Negative cases	
			No.	PCV (%)	No.	PCV (%)		No.	PCV (%)	No.	PCV (%)
N'DAMA (101)	2.0 ^c	56	0	0	56	28.5+/-1.8 ^a	45	2	30.2+/-1.9 ^a	43	33.0+/-2.3 ^a
MUTURU (25)	16.0 ^b	8	0	0	8	34.6+/-2.2 ^b	17	4	36.3+/-1.9 ^a	13	37.1+/-2.4 ^a
KETEKU (318)	18.5 ^a	168	38	21.3+/-0.6 ^b	130	24.5+/-1.0 ^a	150	17	25.3+/-0.4 ^a	133	25.5+/-2.2 ^a
ZEBU (426)	19.7 ^a	191	17	16.8+/-1.2 ^c	174	25.6+/-1.8 ^a	235	68	22.4+/-1.6 ^b	167	26.6+/-0.8 ^a

The N'Dama had a mean PCV of 30.2±1.9% while those negative for trypanosomes had a mean PCV of 33.0±2.3% (p>0.05). The infected Muturu had a mean PCV of 36.3±1.9% while those negative for trypanosome infection had a mean PCV of 37.1±2.4%. The trypanosome positive Keteku had a mean PCV value of 21.3±0.6% while the negative had a mean PCV of 24.5±1.0% (p<0.05). The positive Zebu had a mean PCV of 16.8±1.2% while the mean PCV for negative animals was 25.6±1.8% (p<0.05). None of the 138 abattoir blood samples was trypanosome positive.

Table 3 Prevalence rate of trypanosomiasis across the communities.

Location	No of cattle sampled	Number of positive cases trypanosomes	Positives%
Ogunola	46	18	39.13
Olodo	42	18	42.85
Imeko	45	6	13.33
Total	133	42	31.62

Table 4 Types of trypanosomes species observed across the communities

Location	No of samples	Positives cases%	T.vivax%	T.congolense%	T.brucei %	Mixed %
Ogunola	46	18(39.1)	11(61.1)	4(22.2)	1(5.6)	2(11.1)
Olodo	42	18(42.9)	13(72.2)	5(27.8)	0(0.0)	0(0.0)
Imeko	45	6(13.3)	3(50.0)	2(33.3)	0(0.0)	1(16.7)

Parasitological evaluation of bovine trypanosomiasis to assess its impact in 113 cattle from Ogunola, Olodo, and Imeko in derived savanna areas of Ogun State were carried out. Blood samples were collected aseptically and screened using standard trypanosome detection methods in addition to packed cell volume (PCV) determination. Results showed that mean prevalence rate of bovine trypanosomiasis was 31.62% with varying prevalence across the communities Olodo (42.85%), Ogunola (39.13%) and Imeko (13.33%). Assessing age and infection status revealed that animals over 60 months (5 years) had higher infection rate across all study locations with a statistical significant difference ($p < 0.05$) in infection. Infections were higher among the females than the males but not statistically significant ($p > 0.05$). The PCV values of infected cattle in all locations were lower than the non-infected. *Trypanosoma vivax* prevalence was higher than *Trypanosoma congolense*, and *Trypanosoma brucei brucei* across communities. The common breeds identified were the red Bororo (37.6%), Sokoto Gudali (25.6%) and the white Fulani (36.8%). The white Fulani had higher infection status (18.8%) than the Gudali (9.8%) and Red bororo (3%). The high rate of *T. vivax* and the zoonotic nature of *T. b. brucei* call for urgent control action for humans and cattle.

V. Discussions

An understanding of the distribution and impact of bovine trypanosomiasis in the derived savannah areas of Ogun State had now been documented. This will be a vital tool in planning effective control measures against the vectors and the disease. The percentage prevalence of bovine trypanosomiasis observed in this study calls for concerted efforts in monitoring to effectively address the food security needs of the country. The study showed the mean prevalence of trypanosomiasis across the communities to be 31.62%, with variations in prevalence rate in the studied areas. Ogunola and Olodo had a varying prevalence of 39.13 and 42.85% which were considered higher than results obtained in Imeko (13.33%). Ogunola and Olodo are closer in proximity, which may have contributed to their close prevalence rates. Information from distribution of infection by species of trypanosomes shows that infection due to *T. vivax* was highest in all studied communities followed by *T. congolense*, mixed infection of *T. vivax* and *T. congolense* and lastly by *T. b. brucei*. The distribution of trypanosomes observed are in consonance with report of Omotainse et al. (2000), which observed similar trends in their studies. The incidence of infection due to *T. b. brucei* in Ogunola community, a pastoral settlement close to Alabata the host community of the University of Agriculture is of zoonotic importance as human population could be susceptible host. The mean PCV of infected cattle were significantly lower than the PCVs values of non-infected cattle. This however, agrees with results of Daniel et al. (1994) that severe anaemia is mostly associated with *T. vivax* infections as compared to other species of trypanosomes. Such significant difference of PCV values in infected cattle had been reported in Nigeria and elsewhere (Omotainse et al., 2000; Desquesnes and Dia, 2003; Quadeer et al., 2008), where they demonstrated that haematocrit values of infected cattle decreased during the infection period indicating among others the notable pathogenic effects of mechanically and biologically transmitted trypanosomiasis.

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