

Full Length Research Paper

Bovine trypanosomosis and its impact on cattle in derived savanna areas of Ogun State, Nigeria

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Parasitological evaluation of bovine trypanosomosis 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 trypanosomosis 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.

Key words: Trypanosomosis, derived savanna areas, Ogun State.

INTRODUCTION

Bovine (cattle) trypanosomosis, 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. (Oluwafemi et al., 2007). It is characterized by intermittent fever, parasitaemia, anaemia, lymphadenopathy, jaundice, progressive emaciation, weakness, and reduced productivity. 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 trypanosomosis 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 (PATTEC, 2002). 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 (FAO, 1981).

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 trypanosomosis at bay (Jones and Dovila, 2001). Africa, as estimated by FAO, loses over 3 million cattle and other domestic livestock through deaths caused by trypanosomosis every year (FAO, 2005). In Ogun State a fast growing derived savannah region, information on bovine trypanosomosis remained scanty and considering the emphasis on food security and agriculture, it became imperative to evaluate and assess the prevalence of

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Table 1. Breeds of cattle examined across the communities.

Breed	No. of cattle in Ogunola (%)	No. of cattle in Olodo (%)	No. of cattle in Imeko (%)	Total
Red bororo	17 (37.0)	16 (38.1)	17 (37.8)	50 (37.6)
Gudali	12 (26.0)	10 (23.8)	12 (26.7)	34 (25.6)
White Fulani	17 (37.0)	16 (38.1)	16 (35.5)	49 (36.8)
Total	46 (100.0)	42 (100.0)	45 (100.0)	133 (100)

trypanosomosis and its impact on cattle in derived savanna areas of Ogun State, Nigeria where pastoral activities are very high.

MATERIALS AND METHODS

Study area

Ogun State lies between latitude 7°10'N and longitude 3°21'E in the transitional zone between the tropical rainforest and derived savannah zone in the south-west of Nigeria. It has two seasons, the dry season (November to March) and the wet season (April to October). The study covered three communities namely Ogunola, Olodo and Imeko. Ogunola falls between latitude 7° 13.377' N and longitude 3° 17.967'E; Olodo lies between latitude 7° 16.712' N and longitude 3° 13.761'E, and Imeko is between latitude 7° 13.761' N and longitude 3° 25.204' E. In these areas are found nomadic Fulanis (migrating herdsmen) who rear domestic animals such as cattle, sheep and goats. They live in various bush encampments, houses made of leaves, without proper doors from where they daily carry out their pastoral activities.

Pre-survey contact and mobilization

Preliminary surveys of the communities were carried and ethical clearance secured from the Department of Veterinary Services of the Ogun State Ministry of Agriculture. Consent was obtained from the camp heads (*Seriki*). Breeds of cattle identified were the white Fulani, Sokoto Gudali, Adamawa Gudali, Red Bororo, Keteku, and other breeds which livestock owners described as Bokolo and Yankana in their native *Fufube* dialect. Red Bororo, white Fulani and Sokoto gudali were chosen because of their predominance in the study areas. Pre-tested structured livestock keepers' questionnaires were administered to all livestock keepers in order to collect livestock information. Information required included factors pertaining to cattle health, production and husbandry practices in the study areas (Table 1).

Physical examination of cattle

Physical examinations for age of animals were carried out on all animals before blood sample collection. Each animal was restrained before physical examination and sample collection.

Collection of blood samples

Blood samples were obtained by jugular venipuncture into vacutainer tube containing salt of Ethylene Diamine-Tetra Acetate (EDTA) as anticoagulant. In the laboratory, the blood samples were screened for trypanosomes using standard Trypanosome Detection methods (STDm) namely wet, thick, and thin smear examination as

well as the haematocrit (microhaematocrit) centrifugation buffy coat examination as described by Taylor (1998) and Gasseer (1998). Packed cell volume (PCV) and Buffy coat examination was carried out as described by Paris et al. (1992) in addition to erythrocyte count, and the haemoglobin concentration. The smears were examined under oil immersion lens as described by Murray et al. (1983).

Data analysis

SPSS version 16 software employing chi-square analysis and students' t-test was used in comparing infection and determining the relationship between infection patterns.

RESULTS

Of the 133 bovine examined, the red Bororo were higher in numbers (37.6%) when compared with the Gudali breed (25.6%) and the white Fulani (36.8%). Forty-two bovines tested positive for trypanosomosis (Table 2). The overall prevalence of bovine trypanosomosis across the communities was 31.62%. There were variations in prevalence rates across the communities with Olodo and Ogunola having the highest prevalence of 42.85 and 39.13%, while Imeko had the least prevalence of 13.33%.

Sex-specific rates showed that the females had higher infection status of 20.3% than the males (11.3%) across the communities (Table 3), but Chi-square analysis revealed no significant difference ($p > 0.05$) in infection rates by sex in the communities. Assessing infection by age revealed that cattle above 60 months had the highest prevalence rates when compared with other age groups of 0 - 20, 21 - 40 and 41 - 60 months, respectively. Chi-square statistical analysis revealed a significant difference ($p < 0.05$) in infection rates by age in the communities (Table 4).

Results reported in Table 5 showed that Red Bororo had the least prevalence rate of 3% infection, Gudali had 9.8% infection rate, while a higher prevalence of 18.8% was observed among the white Fulani cattle. Chi-square statistical analysis showed a significant difference ($p < 0.05$) in the distribution of infection by breeds of cattle.

In assessing the type of trypanosomes species observed across the communities, Table 6 revealed that of the 39.1% positive cattle examined in Ogunola community, 23.9% were positive for *T. vivax*, 8.7% were positive for *T. congolense*, 2.2% were positive for *T. b. brucei* while 4.3% were cases of mixed infection. In

Table 2. Prevalence rate of trypanosomosis across the communities.

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

Table 3. Infection status by sex across the communities.

Location	Sex		Sex-specific rates	
	M	F	+ve M (%)	+ve F (%)
Ogunola	19	27	7 (36.8)	11 (40.7)
Olodo	16	26	8 (50.0)	10 (38.5)
Imeko	17	28	0(0.0)	6 (21.4)
Total	52	81	15(28.8)	27(33.3)

Table 4. Distribution of infection by age across the communities.

Age (months)	Ogunola			Olodo			Imeko		
	Number of cattle observed	Positive Cases for trypanosomes (%)	Negative cases for trypanosomes (%)	Number of cattle observed	Positive cases for trypanosomes (%)	Negative cases for trypanosomes (%)	Number of cattle observed	Positive cases for trypanosomes (%)	Negative cases for trypanosomes (%)
0 - 20	21	4 (19.05)	17 (80.95)	20	0 (0)	20 (100)	17	1(5.88)	16(94.12)
21 - 40	12	1 (8.33)	11 (91.67)	10	1 (10)	9 (90)	15	0(0)	15(100)
41 - 60	11	2 (18.18)	9 (81.82)	11	1 (9.09)	10 (90.91)	10	2(20)	8(80)
> 60	2	2 (100)	0 (0)	1	1 (100)	0 (0)	3	1(33.33)	2(66.67)
	46			42			45		

Table 5. Distribution of infection by breeds of cattle.

Breed	Number sampled	Positive cases	Prevalence rate (%)
Red Bororo	50	4	8
Gudali	34	13	38.2
White Fulani	49	25	51.0
Total	133	42	31.6

Table 6. Type of trypanosomes species observed across the communities.

Location	No of samples	Positive case (%)	<i>T. vivax</i> (%)	<i>T. congolense</i> (%)	<i>T. brucei</i> (%)	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)

Olodo community, of the 42.9% positive cases, 30.9% were positive for *T. vivax*, 11.9% were positive for *T. congolense*; while in Imeko community, 6.7% were positive for *T. vivax*, 4.4% for *T. congolense*, and mixed infections were 2.2%.

Assessing trypanosomosis infection status with PCV values showed that cattle that fall between 0 - 23 PCV values had more positive cases across the communities than those with PCV values of 24 - 46 (Table 7). Chi-square analysis showed that significant differences ($p < 0.05$) exist between distribution of infection and packed cell volume.

DISCUSSION

An understanding of the distribution and impact of bovine trypanosomosis 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 trypanosomosis 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 trypanosomosis 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 trypanosomosis.

Though sex prevalence rates revealed a slightly higher percentage among the females, which may however be attributed to the differences in sample sizes, statistically there was no significant difference in the prevalence rates. Onyiah (1997) and Quadeer et al. (2008), in separate studies observed no statistically significant difference in the prevalence rates of cattle by sex. Also to note, is that there is no criteria for which tsetse flies or other biting flies in trypanosomosis uses to discriminate between male or females, all they require is a blood meal for development, though it has been suggested in several reports about the preference of tsetse and Tabanids to cattle against other species (Dinka and Abebe, 2005). The age-specific rates of bovine trypanosomosis show that younger animals (cattle) had lower infection rates. The infection rate progressed up-scale by age with the oldest animals recording the highest percentage prevalence. This could be explained in terms of grazing behaviours of the normal and strength. Older animals are more exposed to vector bites because of their grazing

Table 7. Effect of infection on the packed cell volume (PCV).

PCV range	Ogunola positive (%)	Negative (%)	Imeko positive (%)	Negative (%)	Olodo positive (%)	Negative (%)
Q	5 (20.00)	20 (80.00)	2 (14.29)	12 (85.71)	5 (41.67)	7 (58.33)
24 - 46	1 (4.76)	20 (95.24)	0 (0.00)	31 (100.00)	1 (3.33)	29 (96.67)
Total	6 (13.04)	40 (86.96)	2 (4.44)	43 (95.56)	6 (14.29)	36 (85.71)

habits, whereas, the calves are always kept in their byres (herd/shed) most of the times and grazed near settlement. Breed-specific rate in this study showed that the white Fulani had higher infection rate followed by the Gudali while the red Bororo breed recorded the least infection rate. This observation had been noted earlier by Quadeer et al. (2008) where they compared the white Fulani and the Red bororo, and they observed that the white Fulani had higher prevalence with the least recorded for Red bororo.

Some breeds of cattle have been shown to possess degree of innate resistance against species of trypanosome, though the Red bororo has not been reported in this category of cattle but the result in the present study revealed a statistical significance in prevalence rate of trypanosomosis which may inform a better adaptability of the Red bororo in the study area. This may however be verified in future studies. This finding may also be due to long term acquisition of the Red bororo of certain genetic characteristics to be expressed in terms of trypano-tolerance. Although, in terms of population surveyed in selected communities, Red bororo and white Fulani had the same numbers, population of an animal in such places is greatly influenced by its ability to adapt to the area and also the pastoralist preference based on his own assessment and needs.

With this development, there is also a great need to embark on trypanosomosis control program in this areas and others presenting similar vegetation. There is an urgent need for active surveillance of trypanosomosis for all ruminants, (*Caprine*, *Ovine* and *Bovine* species) bearing in mind the importance of these species in national food security, economy and socio- agricultural importance.

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