Acta Scientific Clinical Case Reports

Volume 4 Issue 4 April 2023

Case Report

Bovine Trypanosomiasis Among Slaughtered Cattle in Lafia Central Abattoir, Nasarawa State, Nigeria

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Received: February 13, 2023

Published: March 09, 2023

Abstract

The tsetse fly and trypanosomiasis are major constraints to the sustenance and growth of the livestock industry in general ecological regions of Nigeria. Combating the challenges they impose on animal health and productivity involves the epizoolotological surveillance surveys, screening of animals to detect infections and chemotherapy with relevant trypanocides. We undertook the screening of cattle brought from their grazing areas for slaughter at the Lafia central abattoir situated in Lafia metropolis, Nasarawa State, Nigeria. Blood samples from the jugular vessels of the animals slaughtered between April and June, 2016 were screened for trypanosome infection using the Standard Trypanosome Detection method (STDM). Out of the 212 samples screened that comprised of 37 males and 175 females, only 3 (1.4%) of the cattle were infected. The prevalence of the infection between sexes showed no significant difference (χ^2 = 0013; df = 1, P = 0.97). The Packed Cell Volume (PCV) of the screened samples ranged from 13% to 51%. The PCV value below 24% was observed among 13.5% bulls and 12.0% cows respectively. The indication of the above findings is in relation to the season of the study and intensity of trypanosomiasis in the grazing areas where the animals were domiciled are discussed. The need for a One Health approach to such an infection cannot be overemphasized.

Keywords: Tsetse Fly; Trypanosomiasis; Livestock Industry; Abattoir; Packed Cell Volume; One Health; Lafia

Introduction

Trypanosomiasis is a zoonotic disease that can spread through blood transfusions. It is brought on by Trypanosoma protozoan parasites and spread by a bloodsucking bug [1,2]. Because of the risks associated with the human-animal-environment interaction, this disease has a considerable impact on One Health concern [3,4].

Humans and animals (most notably pigs) have been identified as the primary hosts responsible for the transmission and spread of Human African animal trypanosomiasis (HAT) caused by *Trypanosoma brucei gambiense* while HAT caused by *T. b. rhodesiense* has wild animals and cattle as the primary hosts [5]. Three variants of trypanosomiasis; the South American trypanosomiasis or Chagas disease caused by *T. cruzi*, the East African trypanosmiasis caused by *T. b. rhodensiense* and the West African trypanosomiasis caused by *T. brucei gambiense* are said to be harmful to humans [6]. HAT caused by *T. b. gambiense* is common in Western and Central

Africa and widely transmitted by tsetse flies (*G. palpalis*) while HAT caused by *T. b. gambiense* is common in Eastern and Southern Africa and transmitted by tsetse flies *G. morsitans)* [5].

African animal trypanosomiasis (AAT) also known as nagana, is endemic in 37 African countries and caused by various species of trypanosomes in many domestic and wild ruminants [5,7,8]. Three important species that causes African animal trypanosomiasis are *T. vivax, T. congolence* and *T. b. brucei* and other forms like *T. suis*, *T. godfreyi* and *T. uniforme,* including other unnamed subspecies of trypanosomes [8]. The animal production industry, as well as valuable domestic livestock, are still suffering from the devastation and losses caused by infection with one or more of these *Trypanosoma* species [9].

Since time immemorial, Africa has carried the heaviest burden of AAT, though the epidemic is spreading to South America and Southeast Asia. Significantly, non-tsetse transmitted *T. vivax* infection has been recognized in Africa, particularly in Ethiopia, Chad, and Sudan [9,10]. Tsetse-transmitted AAT, on the other hand, is the second most economically important livestock disease and the mainstay of the animal health burden in Nigeria, where over 6 million cattle out of an estimated 20 million are at risk. According to reports, African animal sleeping sickness has spread far beyond tsetse-infested areas in Nigeria. The two riverine species (*G. palpalis palpalis* and *G. tachinoides*) have been detected in all six geopolitical zones, in contrast to the savannah tsetse species (which are absent in protected areas).

Apart from tsetse vector control, the management of AAT disease in Nigeria typically entails disease surveillance, chemotherapy, and chemoprophylaxis [11], but there are already rising concerns about the multi-drug resistance to the few available drug classes (isometamidium, homidium, and diminazene), which has had a negative impact on the control and poor treatment outcomes [9,12,13].

In Sub-Saharan Africa and Nigeria, where cattle production accounts for a higher percentage of cases of the ailment, African animal trypanosomiasis continues to have a serious negative impact on the livestock business [14,15]. African animal trypanosomiasis, which manifests as decreased productivity, illness, and death of livestock, including reproductive losses, has a severe economic impact on Nigeria's rural residents' quality of life [16]. Odeniran and Ademola [14] note that there are no national estimates of the disease's prevalence in livestock and tsetse flies, necessitating the necessity for this study in order to add to the available data. Therefore, we undertook the screening of cattle brought from their grazing areas for slaughter at the Lafia central abattoir in Nasarawa State capital.

Materials and Methods

Study area

The study was conducted in part of Lafia town Nasarawa State (Latitude 8°35'N and Longitude 8°40'E), Nigeria. The State was created in 1996 out of a neighboring State, Plateau State.

Nasarawa State lies within the guinea Savannah region and has tropical climate with moderate rainfall (annual mean rainfall of 1311:75 cm). The State is made up of plain lands with good pastures and hills measuring up to 300ft (91.44m) above the sea level at some points.

Sample collection

A total of 212 blood samples spreading across 37 bulls (males) and 175 cows (females) were collected from the cattle brought in for slaughter at the Abattoir between April and June, 2016 just before the raining season set properly. All the animals were transported locally from the nearby LGA to Lafia cattle market, where they are purchased and taken to the Abattoir for slaughter (personal information from the Butchers and Abattoir manager). The cattle were purchased by butchers from herds owners in the neighboring Local Government Area for slaughtering and sale to the public (personal communication with butchers).

About 5ml of blood was collected from the jugular vessels of the animals at slaughter into bijou bottles containing about five milligrams of Ethylene Diamine Tetra Acetate (EDTA). The collected blood samples were kept in a plastic bucket container containing the iced water sachet and then taken to the Zoology Laboratory of Federal University of Lafia for further processing and screening for trypanosomes.

Parasitological processing

The standard trypanosomes detection technique SDTM and HCT concentrated method were employed for the screen of the

blood samples. The haematocrit centrifuge screening technique [17] was carried out as followed. Each blood sample was dram into a capillary tube one end of the tube was sealed with plastocel. The tubes are then arranged in the haematocrit centrifuge and the spin for 10 minutes at 12000 revolutions per minutes. After spinning, the buffy coat region was examined under a light microscope at x10 magnification for presence of trypanosomes. Also, samples were screened for trypanosomes using wet film and stained thin blood films that were prepared and examined according to Kalu and Uzoigwe [18]. The HCT buffy coat method was employed for parasitemia count due to its high sensitivity in the detection of early/scanty trypanosome infection in blood [19].

Packed cell volume (PCV) for each of the blood samples was estimated using the haematocrit centrifuge and reader [17].

Statistical analysis

Data obtained were analyzed using the R-console software version 3.2.2. Proportion of infection rate of trypanosomes, in relation to sexes of cattle was compared using Pearson's Chi-square test. Level of significance was set at $P < 0.05$.

Results

Parasitological diagnosis

Out of the total blood samples screened, only 3 (1.42%) were positive of trypanosome infection (Table 1). The prevalence rate of trypanosome infection in relation to sexes of cattle showed no significant different ($\chi^2 = 0.0013$, df =1, P = 0.9712), however, more cows 3 (1.71%) were infected while no bull 0 (0.0%) was infected.

Sex	Number of screened blood	Number of positive blood (%)	Number of positive HCT	Number of positive wet film	Stained thin film
Female (Cow)	175	3 (1.71)	3	1	0
Male (Bull)	37	0 (0.00)	0	0	0
Total	212	3 (1.42)	3	1	0

Table 1: Prevalence of trypanosomes in blood of slaughtered cattle in Lafia abattoir, Nasarawa State, Nigeria.

Parasitemia were very scanty, hence, the detection by HCT buffy coat method which is a more sensitive technique for detection of early/scanty trypanosome infection in blood was not feasible.

Packed cell volume (PCV)

Figure 1 shows the PCV values of the blood samples collected ranged between 13% and 51%. A total of 26 samples had PCV values less than 24%. Among the males (bulls) blood samples 5 (13.5%) had PCV less than 24% while 21 (12%) of the females (cows) blood had their value equally lower than 24%.

Generally, most of the animals were emaciated and lean which is possibly due to harsh and adverse conditions that prevails during the study period when there is scarcity of grass and water for their feeding.

Figure 1: The PCV ranges of the slaughtered cattle in Lafia metropolis, Nasarawa State, Nigeria.

Discussion

This investigation on bovine trypanosomiasis reveals that just a small percentage of the total blood samples screened were contaminated 3 (1.42%). This probably suggests that the nearby herds of grazing animals are pasture in tsetse-free regions. Also, the low prevalence could be as revealed by the butchers in Lafia abattoir that they buy animals from adjacent Local Government Areas (LGAs). Additionally, the herdsmen possibly make use of appropriate medications, such as trypanocides, to treat their animals for parasitic and viral disorders. The infectivity rate in this study is in accordance with the finding of a research conducted in western Ethiopia where bovine trypanosomiasis prevalence was only 4.3% [21]. Similarly, the low incidence of trypanosomiasis seen in this study is consistent with findings from earlier studies on trypanosomes infection in animals killed in abattoirs in various parts of the world. Out of 634 cattle they screened, Samdi., *et al*. [20] found a low frequency of (2.2%) at the Kaduna central abattoir. Furthermore, the results of this study contradict those of Odeniran., *et al*. [14], who reported a prevalence of (16.1%) out of 53, 924 animals evaluated across Nigeria's six geopolitical zones. Additionally, the results of this study are at odds with those made by Hassan., *et al.* [22] and Idahor., *et al*. [23] on particular breeds of cattle raised in Nasarawa State. Despite the fact that infection was predominate in White Fulani (WF) and Sokoto Gudali (SG) for all cattle breeds, Hassan., *et al*. [22] documented (53.33%) prevalence out of 150 White Fulani (WF) and Sokoto Gudali (SG) cattle breeds sampled in Lafia, Nasarawa State, while Idahor., *et al*. [23] reported (16.4%) prevalence out of 110 cattle screened in Keffi North districts of Keffi L. G. A., Nasarawa State, but infection was dominant in White Fulani (WF) and Sokoto Gudali (SG) for all cattle breeds sampled. This may indicate the necessity to improve trypano-tolerant features in cow breeds and also adopt the usage of pertinent chemotherapeutic and chemoprophylactic procedures by the herders.

Although, the current Lafia East Development Area is one part in the Lafia LGA where tsetse and trypanosomes are known to be prevalent, in accordance withthe biological control of tsetse fly (BICOT) programme [24]. In blood samples from settled and slaughtered cattle, the study in the area found that tsetse fly prevalence was (9%) and (10.5%), respectively. Therefore, it would seem that the rare infections that were noted affected animals that were obtained from this region.

The majority of the animals that were slained in this investigation of bovine trypanosomiasis in cattle at the Lafia Abattoir were cows and may account for why they were more infected 3 (1.71%). Interestingly, all bulls (males) were trypanosome free which may possibly be due to their physiological and immunological condition.

One of the primary symptoms of animal trypanosomiasis is anemia [25,26]. Overall, the majority of the animals' estimated PCV from blood samples was within normal limits. Despite the animals being severely underweight and thin, this is the case. One animal sample had the lowest PCV level (13%), which is symptomatic of anemia. Also, the observation of the PCV on the animal suggests that the majority of the animals were not exposed to the tsetse fly and trypanosome challenge, and as a result, they were not harboring any trypanosome infection as seen in the negative blood samples. The findings of other authors' studies do not match the observations made in this study. The mean PCV of the parasitemic (20.48%) and non-parasitemic (25.77%) in Gidami District, Oromia Regional State, western Ethiopia, and the mean PCV of the parasitemic (22.83 ± 1.22) and non-parasitemic (35.02 ± 0.67) in Gwagwalada and Karu abattoirs, Abuja, Nigeria, respectively, were reported by Abah., *et al*. [27] and Degneh., *et al*. [28]. It is possible to interpret this literally as a trypanosomal infection.

The late dry season was the time for this study and sample collection. Animals during this time experience a great deal of stress due to a lack of pasture and water [29,30]. Therefore, rather than trypanosomiases, which can also cause such signs and symptoms, the emaciation and cachezia observed are most likely caused by a lack of food and water during the dry season [31-33].

All of the infections found in the Lafia abattoir had extremely low parasitemia. Base on this, all STDM employed, with the exception of buffy coat concentration techniques, failed to detect parasites. Since the parasites were not visible in the thin films, it was not possible to identify the species of the infecting trypanosomes. *Trypanosma vivax* and *Trypanosma brucei brucei* are thought to be the infecting trypanosome species based on the movement of the parasites.

The low parasitemia found in this study may be due to two things. Firstly, it's possible that the few parasites found are the

result of recently transmitted infections by tsetse fly vectors. It is challenging to find parasites at such an early stage, and the only way to do so is with a very sensitive parasitological technique like the HCT buffy coat method [26,34]. One of the slaughtered cattle had internal organs that had been coloured and harmed by a toxic drug reaction, providing evidence of animal abuse.

Conclusion

Prevalence rate of trypanosome infection in cattle slaughtered in Lafia abattoir is low (3.3%) and is an indication that the cattle are grazing in trypanosome free areas. It was evident that herd owners do treat their animals against parasitic and infectious diseases by use of relevant drugs. PCV level of 13% was observed and was an indication of anemia in one of the animals.

There is need for herd owners to control and prevent the spread of tsetse flies from their grazing, drinking and resting areas through biological control of the flies since their habitats cannot be destroyed as a result of being a protected areas. Strategic control of bovine trypanosomiasis including vector control should be strengthened to improve livestock production and agricultural development in the area. Attempt should be made to expand government and private veterinary services to serve the community properly. Further surveys and studies should be conducted in order to appropriate and implement feasible control of trypanosomiasis and/or vector. Educating animal owners on the problems of trypanosomiasis infection and its control measure cannot be overemphasized. One Health approach to such an infection should not be taken for granted.

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