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Tsetse and Other Biting Flies in Five Districts of Kaura Local Government Area, Kaduna State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Authors AJD and EII designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors AJD, EII, PMD and ACI managed the analyses of the study. Authors AJD, EII, GA and SOO managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

A survey of tsetse and other biting flies in Kaura LGA of Kaduna State was under taken. The study was undertaken to determine the presence of tsetse flies, species, their infection rate, distribution and other biting flies in the study area. The study was carried out between September and November, 2010. A total of six sampling sites were considered. The same number of traps was deployed in each sampling site during the study period. Twenty biconical and NITSE traps were used for trapping tsetse flies. A total of 104 biting flies were caught. These were made up of 32 tsetse flies, 55 *Tabanus,* 14 *Stomoxys* and 3 *Chrysops* species. Out of the 32 tsetse flies, 28 were

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identified to be *Glossina palpalis* (16 females and 12 males), while 4 were *G. tachinoides* (3 females and 1 male). The result of fly dissection showed 3 (9.4%) flies were infected with trypanosomes. Out of this number, 2(6.3%) were female *G. p. palpalis* and 1(3.2%) was a female *G. tachinoides*, all infected with *T. vivax.* The implication of this finding is that the preponderance of tsetse flies and other haematophagous flies, with potentials as mechanical transmitters of *T. vivax,* could indicate a high likelihood of trypanosomiasis in the study area.

Keywords: Tsetse; stomoxys; tabanus; glossina.

1. INTRODUCTION

African trypanosomiasis is cyclically transmitted by tsetse flies, although other haematophagus insects are capable of transmitting mechanically the parasite, mainly *T*. *vivax* [1,2]. The word tsetse originated from the Tswana (Botswana) language and means "fly which kills livestock". It affects both humans (sleeping sickness) and animals (Nagana) and occurs in 37 sub-Saharan countries covering more than 9 million km^2, an area which corresponds approximately to one-third of Africa's total land area. The infection threatens an estimated 60 million people and about 50 million head of cattle [3].

Over 10 million Kilometers in 37 countries in Africa are infested by tsetse (*Glossina)* [3], preventing or seriously hindering the raising of livestock and creating a health risk to human inhabitants. It has been estimated that such infested areas are capable of supporting an extra 120 million cattle, 150 million sheep plus 250 million goats [4]. It has been found that the current livestock production in these areas could be increased in terms of weight gain, milk production and enhanced fertility if the disease was controlled more effectively.

Every year, the disease causes about 3 million deaths in cattle while approximately 35 million doses of trypanocidal drugs are administered. Nagana has a severe impact on agriculture in sub-Saharan Africa. The economic losses in cattle production alone are in the range of US$ 1.0 - 1.2 billion. A ponderated evaluation extrapolated for the total tsetse-infested lands values total losses, in terms of agricultural Gross Domestic Product, at US$ 4.75 billion per year.

Out of about 23 known species of tsetse flies found in Africa, 11 are found in Nigeria [5]. All of these 11 species are capable of transmitting the disease to both man and animal but at different levels of vectorial capacity. These species differ from each other in respect of habitat, distribution and host preference [6].

When a tsetse fly feeds on the blood of an infected host it ingests blood-stream forms of the trypanosome. Within the tsetse, a series of changes take place in the trypanosome before transformation to the infecting metatrypanosome occurs. In the course of the next blood meal, the infective metatrypanosomes (metacyclic forms) will be transmitted to another host.

In the tsetse fly, the period from ingesting infected blood to the appearance of the infective forms varies from one to three weeks. Once infective metatrypanosomes are present the tsetse fly remains infective for the remainder of its life.

2. MATERIALS AND METHODS

2.1 Study Area

Kaura LGA is situated in the southern part of Kaduna State. The LGA lies between Latitude 9^o and 9° 49" North and Longitude 8° and 8° 40" East within the Sudan and Guinea savannah region. The rainy season in the area is 6 months (April to September) with a mean annual rainfall of 2000-10000 mm, temperature of 24-27℃ and relative humidity of 40-60% in January and 60-80% in July [7,5]. The survey covered a total of ten villages in the five districts of the LGA. The study area is bounded on the North by Zangon Kataf LGA, on the West by Jema'a LGA, all in Kaduna state. On the East, the area is bounded by Bassa and Riyom LGAs of Plateau state (Fig. 1).

2.2 Vector Study Sites

The study was undertaken to determine the presence of tsetse flies, species, their infection rate, distribution and other biting flies in the studyarea. The study was carried out between September and November, 2010. A total of six sampling sites were considered. The same number of traps was deployed in each sampling site during the study period. Twenty biconical and NITSE traps were used for trapping

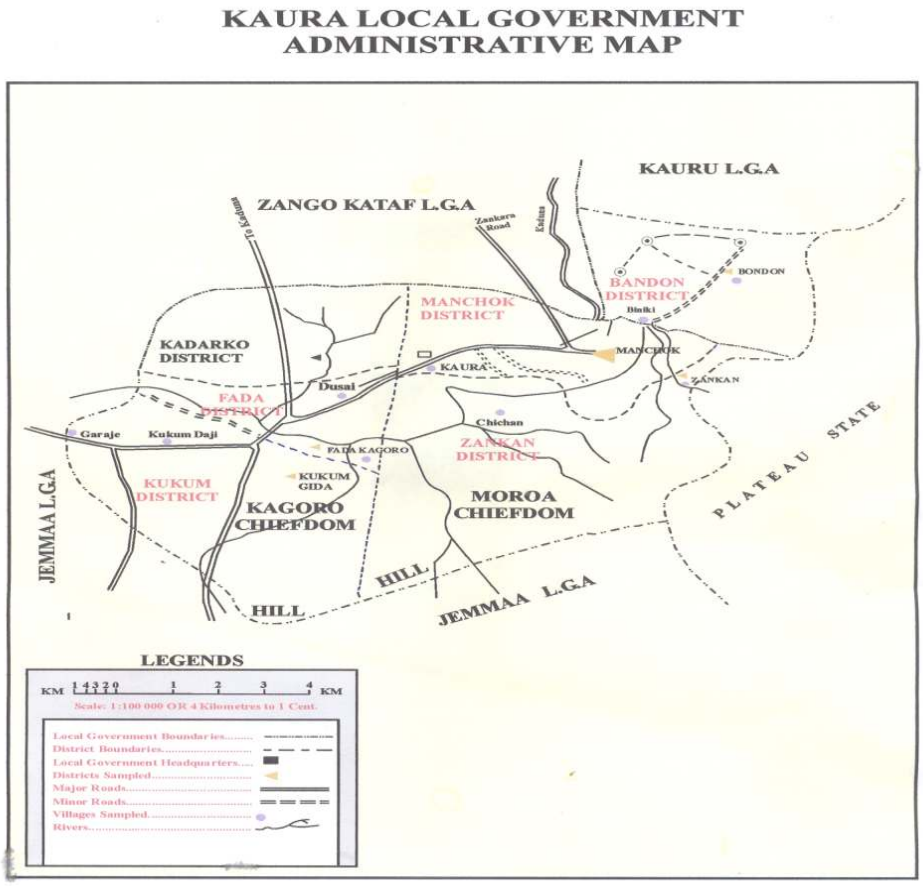

Fig. 1. Map of study area – Kaura LGA
(Source: Works Department, Kaura LGA, 2008)

tsetse flies. They were set at approximately 100 m interval around Fulani settlements, fringing riverine forests, water courses, animal crossing points and livestock farms. The traps were set early in the morning by sunrise and left for 24 hours before harvesting, throughout the period of the study.

The tsetse flies caught were identified by their morphological characteristics such as size, colour, tarsal claws, etc. They were dissected using dissecting pins under dissecting microscopes. A drop of normal saline was placed on a glass slide and placed on the dissecting microscope. The wings and legs of the flies were clipped off while various parts of the flies were carefully teased out and examined for trypanosome infection. The parts include proboscis, thorax and the abdomen. The trypanosomes were identified through their motility on wet mount during dissection. Furthermore, smears of the gut were made on glass slides and stained with Giemsa stain for further morphological identification.

3. RESULTS

A total of 32 tsetse flies were caught in the course of the study (Table 1). This was made up of members of the *Palpalis* group - *Glossina palpalis* and *G. tachinoides.* Out of this number, *G. palpalis* accounted for 28 flies, made up of 12 males and 16 females. The remaining 4 were *G. tachinoides,* made up of 1 male and 3 females. The result of the tsetse fly dissection revealed that 2(6.3%) female *G. Palpalis* were infected with trypanosomes. None of the males were found to be infected. One (3.1%) female *G. tachinoides* was also found to be infected with trypanosomes. The site of location of the trypanosomes as well as their motility in the preparation shows the infecting trypanosome to be *T. vivax.* Overall, the infection rate of the flies was 9.4%.

Table 1. Prevalence and infection rate of *Glossina* species in five districts of Kaura LGA, Kaduna State, Nigeria

Glossina species	Sex	Number caught	Number (%) Infected with *Trypanosoma* species	*Trypanosoma* species
G. palpalis	Males	12	-	-
	Females	16	2 (6.3)	*T. vivax*
G. tachinoides	Males	1	-	-
	Females	3	1 (3.1)	*T. vivax*
Total		**32**	**3 (9.4)**	

Table 2. Prevalence of other biting flies in five districts of Kaura LGA, Kaduna State, Nigeria

District	Species of flies and number caught		
	Tabanus	***Stomoxys***	***Chrysops***
Kaura	10	2	-
Zankan	15	3	-
Bondon	5	2	-
Fada Kagoro	15	4	2
Kukum	10	3	1
Total	**55**	**14**	**3**

Furthermore, a total of 72 other biting flies were also caught in the course of the study (Table 2). These were made up of 55 *Tabanus* and 14 *Stomoxys calcitrans* and 3 *Chrysops*. The result of their dissection, however, did not reveal any positive case.

4. DISCUSSION

The study established the presence of tsetse flies in the study area as well as trypanosomes infecting the flies. However, no statistical method was used to interpret the results.

Vector abundance in this study corroborates reports by [8] and [9], in the contiguous vegetational zones of Plateau and Kaduna States, although the riverine species of tsetse flies encountered during the study have lower vectorial capacity than the *Morsitans* group. However, association between hosts (Man & animals) with the riverine tsetse can be close and prolonged, resulting in high infection rates in livestock. The relatively high prevalence rate of trypanosomiasis could be attributed to the high infection rate in tsetse flies dissected and found to be infected with trypanosomes. One infected fly is capable of infecting a whole herd during its life time.

Furthermore, the preponderance of other haematophagous flies present in the study area with potentials as mechanical transmitters of *T. vivax* [10] could equally be responsible. In the same vein, management practice, nutritional status and host vector contact could also be responsible for the high prevalence rate among the sample animals [11,5,12,13].

5. CONCLUSION

Unlike the tsetse flies that have well defined ecological and microclimatic niches, the other haematophagous flies are able to survive in a wider area with the same ability to mechanically transmit *T. vivax.* Thus they are able to follow livestock over long distances, at times even up to their pens or crutches. They are also able to bite during periods considered as odd times for tsetse flies. The implication of this finding therefore is that the preponderance of these other haematophagous flies, that have potentials as mechanical transmitters of *T. vivax,* could indicate a high likelihood of trypanosomiasis in the study area.

The result of the survey offers fresh information about fly abundance in the study area, bearing in mind human activities along the streams such as farming, bush clearing and movements of livestock into and out of the area due to recent unrests and communal clashes between herdsmen and local farmers.

Furthermore, the result of the survey is useful in providing new knowledge about vectors of trypanosomiasis in the study area. The disease has remained a source of loss to livestock farmers despite the fact that the major vectors are not as abundant as they use to be. The

presence of other biting flies and the preponderance of *T. vivax* is a sign to support the fact that a lot more need to be done in terms of vector control. The study area is easy to reach. The only problem is that of insecurity between livestock owners and farmers whereby proper monitoring of the fly situation is at the risk of the workers. In the long run, the objectives of the study have been reached.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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