KNOWLEDGE AND PREVALENCE OF HUMAN AFRICAN TRYPANOSOMIASIS AMONG RESIDENTS OF KACHIA GRAZING RESERVE, KADUNA STATE 2012.

BY

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ATTESTATION

I attest that the work in the dissertation entitled knowledge and prevalence of Human African Trypanosomiasis (HAT) among residents of Kachia Grazing Reserve in Kachia Local Government Area (LGA), Kaduna State 2012 was performed by me in the Department of Community Medicine under the supervision of Dr A. A. Aliyu and Dr A. Abubakar.

The information derived from the literature has been duly acknowledged in the text and list of references provided. No part of this dissertation has been previously presented for another degree or diploma at any university.

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Name of Student **Signature** **Date**

CERTIFICATION

This dissertation entitled knowledge and prevalence of Human African Trypanosomiasis (HAT) among residents of Kachia Grazing Reserve in Kachia Local Government Area (LGA), Kaduna State, Nigeria 2012 by Uba Belinda Vernyuy meets the regulations governing the award of Masters Degree in Public Health, Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This work is dedicated to all those who contributed their professional services, personal efforts and financial resources towards the successful conduct of the study. To my husband and lovely kids, I love you all and will always cherish you for your love, care, support and prayers.

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ABBREVIATIONS

AT	Animal Trypanosomiasis
CATT	Card Agglutination Test for Trypanosomiasis
CI	Confidence Interval
CSF	Cerebro Spinal Fluid
DALYs	Disability Adjusted Life Years
DHS	Demographic and Health Survey
ELISA	Enzyme Linked Immunosorbent Assay
FAO	Food and Agricultural Organization
HAT	Human African Trypanosomiasis
IL	Interleukin
LGA	Local Government Area
NITR	Nigerian Institute for Trypanosomiasis Research
PAAT	Programme against African Trypanosomiasis
PATTEC	Pan African Tsetse and Trypanosomiasis Eradication Campaign
PCR	Polymerase Chain Reaction
T.b.	Trypanosoma brucei
TNF	Tumour Necrosis Factor
WBC	White Blood Count
WHO	World Health Organization

SUMMARY

Human African Trypanosomiasis (HAT) is a vector borne parasitic disease transmitted to humans by bites of infected tse-tse flies. It is one of the neglected tropical diseases that pose millions of people in sub-Saharan Africa at risk of contracting the disease and is earmarked for elimination by the World Health Organization (WHO). In 2006, Nigeria was listed amongst endemic countries with transmission occurring in a known endemic focus of Delta State however, it had been difficult to assess whether transmission is occurring elsewhere in the country due to the lack of active surveillance in other parts of the country. Reports of nuisance and bites from tse-tse flies by residents of the grazing reserve and the dearth of literature on the prevalence of HAT in the grazing reserve led to the survey to determine the knowledge and prevalence of HAT among residents of Kachia grazing reserve.

A cross sectional descriptive study was conducted using a multi-stage sampling technique with probability proportionate to size. Respondents were administered structured questionnaire on socio demographic characteristics, knowledge and practices relating to HAT prevention and predisposition to risk factors for HAT infection by trained interviewers and then screened for HAT antibodies using card agglutination test for Trypanosomiasis (CATT). Knowledge of HAT was scored into 5 domains and categorized as poor knowledge (score 0-2) and good (score 3-5). Predisposition to risk of infection was defined as frequent exposure to ≥two known risk factors for HAT. A case of HAT was defined as any respondent that tested positive on CATT. Descriptive statistics, bivariate and logistic regression were used to analyse the data and significance was set at 0.05.

The mean age of the 300 respondents that were sampled was 39±17years. One hundred and sixty-nine (56.3%) were males. Only 36(12.0%) had adequate knowledge on HAT and 120(40.0%) would seek medical help in a hospital if affected. Respondents exposed to risk factors were 229(76.3%). Common practices relating to HAT prevention among respondents included clearing of overgrown bushes around houses 297(99%), use of

insecticidal treated nets and the use of protective clothing when visiting the bush 123 (41.0%). Male respondents Odds Ratio (OR) 5.0 (CI 1.8, 13.6), age of 40years and above OR 5.0 (CI 1.1, 24.4) and family history of HAT OR 8.7 (CI 2.4, 32.1) were factors associated with having good knowledge of HAT and practice of HAT prevention measures. None of the 300 respondents screened for HAT antibodies tested positive.

The respondents' knowledge about HAT was poor despite lots of preventive measures being put in place to prevent exposure to the insect vector. Though infested by tse-tse flies, a zero prevalence of HAT was recorded in the grazing reserve. There is need for concerted efforts both at the national, state and local government levels to be put in place to control these vectors.

Key Words: Human African Trypanosomiasis, Prevalence, Knowledge, Preventive practices

CHAPTER ONE- INTRODUCTION

1.1. Background

Human African Trypanosomiasis (HAT) also known as Sleeping sickness is a serious scourge to the African continent including Nigeria. It is one of the most neglected tropical diseases[1] targeted for elimination by the World Health Organization (WHO) and millions of people in 36 countries in sub-Saharan Africa are at risk of contracting the disease.[2] The occurrence of HAT is restricted to the distribution of its vector; the tse-tse fly, which is exclusively found in sub-Saharan Africa between 14°N and 20°S.[1] More than 250 discrete active sleeping sickness foci are recognized, most of which are in poor and remote rural areas where health systems are often weak. However, the disease has also been reported in peri-urban areas.[1]

The disease which was in epidemics in the 1920s was controlled by active surveillance, case management and vector control measures through aerial spraying and by the mid 1960s, the disease had almost disappeared. After this success, surveillance was relaxed, and the disease reappeared in several areas.[2] In 1986, it was estimated that some 70 million people lived in areas where disease transmission could take place with an upward trend of new cases.[2]

This re-emergence of HAT has been attributed to war, migration[3, 4] of carrier populations from active foci, environmental deterioration, increasing parasite drug resistance[3] changes of the tse-tse flies host preference, genetic variability of the parasite, the existence of asymptomatic parasite-infected individuals, and lack of surveillance plus maintenance of infection in animal reservoirs.[3, 4]

By 2005, surveillance for HAT was reinforced and the number of new cases reported in the continent was reduced. Between 1998 and 2004 the number of cases of the disease fell from 37, 991 to 17, 616.[2] In 2006, WHO noted that *Trypanosoma brucei (T.b) gambiense*

caused most of the estimated 300,000-500,000 infections and Nigeria was listed amongst the countries reporting less than 100 cases. Following continued control efforts, the number of cases reported in sub-Saharan Africa in 2009 had dropped below 10, 000 for first time in 50 years.[2] Estimates have shown that the Democratic Republic of Congo has the greatest number of cases, followed by Angola with around 100 000 prevalent cases, though only a fraction of the exposed population is believed to be under adequate surveillance.[5]

Sleeping sickness, coupled with Nangana, the animal form of African trypanosomiasis, has been a major obstacle to sub-Saharan African rural development and affects agricultural production. The socioeconomic impact of the disease includes the loss of productivity resulting to poverty and poor socioeconomic development.[6] Both human and animal trypanosomiasis are implicated in the underdevelopment of the African continent, and is considered a major obstacle in agricultural production to provide food security, sustainable economic growth and healthy populations.[6]

HAT mainly affects the poor and remote rural regions although it has been reported in urban and peri- urban areas.[7] It affects children and adults[7, 8] and affects men and women equally. People in the labour market are affected more often than others. It also affects at higher rates people who moved around a lot and those who worked in rural or domestic activities, especially those in close contact with watercourses.[7] Transmission of HAT occurs during outdoor activities like farming, hunting, fishing or washing of clothes.[8]

The importance of the various components of the epidemiology of trypanosomiasis (human, animal, vector control, agricultural activity, and livestock production) and their impact on the development of rural Africa led WHO, in 1995, to promote together with the Food and Agriculture Organization (FAO), the International Atomic Energy Agency and the African Union Inter African Bureau for Animal Resources, an inter-sectoral initiative that ultimately became, in 1997, the Programme Against African Trypanosomiasis (PAAT). African heads

of state and governments during the African Union Summit in Lomé in 2000 established the Pan African Tse-tse and Trypanosomiasis Eradication Campaign (PATTEC) with an objective of rendering Africa a tse-tse and trypanosomiasis-free continent.[9]

To achieve the 1997 World Health Assembly elimination resolution, the WHO HAT Surveillance and Control Programme established a new initiative based on a global alliance bringing together all actors concerned about the disease.[6] In 2003, the World Health Assembly called on member states to sustain the effort to eliminate the disease as a public health problem, which led the WHO programme to intensify its coordinating efforts, bringing together national control programmes, nongovernmental organisations, research institutions, and other concerned United Nations Agencies. This coalition led to scaling up of field activities and better knowledge of the disease distribution and a reduction in new cases by 2006.[6]

The distribution of HAT is restricted to sub-Saharan Africa where there are suitable habitats for the tse-tse fly vector.[8] *T. b. gambiense* is distributed mainly in western and central Africa. *T. b. rhodesiense* is confined to eastern and southern Africa.[10] The occurrence of Human African Trypanosomiasis (HAT) in an area is acutely determined by the presence of three factors: the parasite (Trypanosoma), the vector (Glossina or tse-tse fly) and the human host. Tse-tse populations are influenced mainly by density independent factors such as temperature and humidity, which in turn depend on vegetation cover. Fly densities are determined by the availability of hosts and of suitable habitats.[11]

1.2. Problem Statement

HAT is a public health problem in sub-Saharan Africa. The disease if left untreated can result in high fatality rates.[1, 5] Human infections reduce labour resources, while the animal disease limits availability of meat and milk and deprives African farmers of draught animal power, substantially minimising crop production.Children affected by the disease suffer

considerable delay in their mental development which impacts negatively on their school performance and professional advancement.[12] The prevalence of animal trypanosomiasis in Kachia grazing reserve as recorded by the Nigerian Institute for Trypanosomiasis Research (NITR) in 2010 was 40.9%.[13] However, the prevalence of HAT in the reserve is unknown despite persistent reports of nuisance and bites by tse-tse flies from the residents of the grazing reserve.

The inhabitants of this community mostly are at risk as they live with their livestock and work with them near rivers and streams during both wet and dry season in areas infested by tse-tse flies. Studies conducted in other parts of the country in Jos, Plateau state Nigeria, isolated *T. b. gambiense* in domestic and hunting dogs[14] and the use of these animals in the grazing reserve by the residents as they move about with their cattle in search for pasture and other activities predispose these domestic animals to infection with T. b. *gambiense* and could serve as reservoire hosts for the disease transmission to humans.

1.3. Justification

There is dearth of literature on the prevalence of HAT in the Kachia grazing reserve since there hasn't been any documented study on the screening of residents for the disease. There is also lack of a systematic active surveillance system for HAT in some parts of the country as documented by WHO,[15] hence the need to determine the HAT situation in this locality. This study will provide baseline information on the prevalence of HAT in the grazing reserve and this can also aid in informed decisions by policy makers including the implementation of disease prevention and control measures. Hence the need to embark on this study.

The possibility of obtaining a zero prevalence of HAT among residents in this study cannot be overlooked as a lot of factors could lead to negative screening results in a community that the disease is expected to be present. These factors include non infectivity of the vector

as only tse-tse infected with the human infective form of trypanosome can transmit infections to humans following tse-tse bites.[12] The role played by domestic animals in transmission of parasite to humans has also been documented to be unclear as to whether they increase the transmission to humans or on the contrary act as bait thus providing some degree of protection to humans[16]. Another factor is the genetic susceptibility of an individual to infection and the parasite's virulence.[17] The existence of trypanotolerance in humans[18],[19] has been documented in individuals who somehow would control infection by *T. b. gambiense*.[16, 20]

1.4. Research Questions

1. How knowledgeable are the residents of Kachia grazing reserve regarding HAT?
2. How exposed are the residents of Kachia grazing reserve to risk factors for HAT transmission?
3. What is the prevalence of HAT among residents of Kachia grazing reserve?
4. What are those practices among residents of Kachia grazing reserve relating to HAT prevention

1.5. General and Specific Objectives

1.5.1. General Objective

To determine the knowledge and prevalence of HAT, among residents of Kachia grazing reserve so as to provide baseline information and inform decision making by relevant authorities.

1.5.2. Specific Objectives

1. To determine the knowledge of HAT among residents of Kachia grazing reserve.
2. To determine the exposure to risk factors for HAT infection among residents of Kachia grazing reserve.
3. To determine the prevalence of HAT among residents of Kachia grazing reserve.

4. To determine practices relating to HAT prevention among residents of Kachia grazing reserve.

CHAPTER TWO - LITERATURE REVIEW

2.1. Epidemiology

Human African Trypanosomiasis is a vector borne parasitic disease which is transmitted to humans by bites of infected tse-tse flies (Glossina genus) that have acquired their infections from human beings or from animals harbouring the human pathogenic parasites.[12] The Trypanosomes are of two types; *Trypanosoma brucei (T.b.) gambiense* which is the type found in Nigeria, (causative agent for West and Central African type) and *Trypanosoma brucei (T.b.) rhodesiense* (causative agent for East and Southern African type).

2.1.1. Mode of Transmission and life cycle

T. *b. gambiense* is anthroponotic, that is; it depends mostly on human to human transmission[8, 16] through a direct man-fly-man transmission cycle which is considered more important[10] and man provides the main reservoir. The closeness of human-fly contact is particularly important for the transmission of *T. b. gambiense*, and it is probably a major factor in the distribution of the disease. Other factors such as human behaviour and the presence of an animal reservoir have been documented to contribute to the maintenance of the disease in an area.[11] Several studies have shown that wild and domestic animals like pigs could be infected by *T. b. gambiense*, which could act as animal reservoirs of the disease[8, 10, 16] however the role played by these animal reservoirs in parasite transmission to humans is still unclear.[16]

T. b. rhodesiense, is a zoonosis transmitted from animals to man. Although for a long time, wildlife were considered the most important and perhaps the only reservoir for *T. b. rhodesiense* and animal trypanosomiasis (AT) in livestock, it has been demonstrated that cattle remain an important reservoir for *T. b. rhodesiense.*[8, 10] The acute nature of sleeping sickness due to *T. b. rhodesiense* makes the presence of a non-human reservoir obligatory in

maintaining an endemic focus. Wildlife is known to play a continued role in the transmission of sleeping sickness.[10]

Domestic and wild animals can become infected with *T. b. gambiense and T. b. rhodesiense* and though they do not fall ill, they have an epidemiological role as carriers or reservoir animals from which tse-tse flies can acquire infection[8] and thereby transmit to man and their livestock.[8, 10] Sporadic reports of sleeping sickness in man caused by non human pathogenic trypanosome species *T. b. brucei*, *T. congolense* and *T. evansi* which naturally cause the trypanosomiasis in animals have also been reported.[21]

HAT though mostly transmitted through the bite of an infected tse-tse fly has other ways in which people are infected with the disease.[2]

- Mother-to-child infection: the trypanosome can cross the placenta and infect the foetus.[22]
- Mechanical transmission through other blood sucking insects is possible.
- Accidental infections have occurred in laboratories due to pricks from contaminated needles.

The hallmark of HAT is that it evolves in two distinct successive stages depending on whether the parasites have become manifest in the cerebrospinal fluid:[1] The first stage is the haemo-lymphatic stage, which is defined by the restriction of trypanosomes to the blood and the lymph systems.[1] Following inoculation, there is proliferation of the parasite at the site of infection leading to an inflammatory nodule (trypanosomal chancre) mostly seen in the Rhodesian type but rarely in the gambiense infections.[8, 23] Spreading of the parasite from the site through draining lymph node to reach bloodstream initiates the haemo-lymphatic stage of the disease which is characterized by intermittent headache, fever, general malaise, severe pruritus with scratching, skin lesions, mobile or rubbery

lymphadenopathies develops after several weeks in the posterior triangle of the neck (palpable sub-clavicular and cervical lymph nodes) known as the Winter bottom's sign.[1, 8, 23] Parasites at this stage can be detected in blood, lymph and tissue aspirate however they are usually below detection levels for gambiense trypanosomiasis.[23]

The second stage is the meningo-encephalitic stage, which is characterized by the active invasion of the central nervous system.[1] It occurs within a few weeks of infection for *T.b. rhodesiense* but over a period of months to years for *T.b. gambiense.*[23] Features in this stage includes persistent severe headache and sleep disorders- predominantly due to the disturbance of the circadian rhythms resulting to daytime somnolence and nocturnal insomnia in some patients.[8, 24] Hence; the name "Sleeping Sickness". Of note here is that overall, the sleep time is unaltered.[23] Neurological symptoms includes Parkinson-like movements due to muscular hypertension, tremor, fasciculations, general motor weakness, hemi paresis, akinesia or dyskinesia, movement and speech disorders and abnormal archaic reflexes.[8, 25] Personality changes include impaired mental functions, confusion, psychiatric symptoms like, psychotic and aggressive behaviour, can dominate the clinical picture and may constitute the first manifestation of the disease.[8, 23, 25] Endocrine disorders of the thyroid and adreno-cortical function can take the form of hypo function or hyperfunction.[1] Progressive involvement of the Central Nervous System (CNS) culminates to coma and death in untreated cases.[23] At this stage parasites can be detected in the Cerebro-Spinal Fluid (CSF). Following the host's inflammatory response, Immunoglobulin M (IgM) concentrations are elevated and lymphocyte cell count is high (>5 x104/µL) and protein is also increased >25mg/dl.[23]

The two forms of the disease *(T. b. rhodesiense and T. b. gambiense*) have different ecology, pathology, and epidemiology. *T. b. rhodesiense* progresses from early non-specific symptoms to infection of the central nervous system with poor demarcation between stages

and death within months, while *T. b. gambiense* typically follows a chronic clinical course progressing over several years[1, 23, 26, 27] and is fatal if left untreated.[1, 5]

2.1.2. Diagnosis

Diagnosis of *T. b. gambiense* HAT relies on a three-step pathway[1, 26] (i) screening using the Card Agglutination Test for Trypanosomiasis (CATT); (ii) parasitological confirmation which relies on the microscopic search for trypanosomes in the inoculation chancre smear or cervical lymph node fluid (sampled by puncture), or in the blood using thin or thick blood films and concentration methods such as the quantitative Buffy coat (Woo) technique, micro-haematocrit centrifugation technique and the miniature anion-exchange centrifugation techniques (iii) examination of trypanosomes in the cerebro-spinal fluid (CSF) for staging because treatment substantially differs between the first (haemolymphatic) and second (meningo-encephalitic/neurologic)stage. Presence in the CSF of trypanosomes, more than five WBC per microliter or increased protein content>370mg/dl defines second stage disease. [1, 8, 26] Unlike *T. b. gambiense*, there is no serological screening test for *T. b. rhodesiense*. Rather, identification is based on non specific clinical presentation, history of exposure and parasitological confirmation for *T. b. rhodesiense* is easier because the density of circulating parasites in the blood is higher than for *T. b. gambiense*.[8]

2.1.3. Treatment

Treatment of HAT involves the use of specific anti-trypanosomal drugs Pentamidine isethionate for first stage and Melarsoprol, Nifurtimox and Eflornithine as combination drugs called nifurtimox eflornithine combination therapy (NECT) for second stage treatment.[1]

2.1.4. Strategy for HAT control

As one of the most neglected tropical diseases, HAT is characterized by the limited availability of safe and cost-effective control tools. No vaccine against HAT is available, and the toxicity of existing old and cumbersome drugs precludes the adoption of control strategies based on preventive chemotherapy. As a result, the keystones of interventions against sleeping sickness are active and passive case-finding for early detection of cases, treatment of infected individuals and vector control and animal reservoir management.[1, 23]

Active surveillance, case treatment and vector control have been found to be extremely effective in reducing disease transmission, particularly for *T. b. gambiense*, which is generally confined to a human-fly-human cycle. *T. b. rhodesiense* transmission to humans however, is influenced by prevalence of the parasite in the animal reservoir; and livestock represent an important reservoir hence control of livestock infection and tsetse populations are important for reducing *T.b. rhodesiense* transmission to humans.[27]

Vector control measures includes insecticide spraying- generally and selectively targeting areas infested by the tsetse flies, use of tsetse traps and targets especially when odour baited and impregnated with insecticides and the sterile insect technique in which sterile males are released to mate with the females unproductively[23]

2.2. Knowledge and Practices towards HAT Prevention

A study on Knowledge, practices and prevalence was conducted in Northern Nigeria among migrant Fulanis on HAT Between January and February 1977 in which 130 Fulanis were interviewed at different locations in the transhumance-route followed by the Fulanis around Lake Kainji area of Nigeria. Respondents were between 20-60 years of age and in addition to cattle rearing, farming was practised among the Fulanis interviewed at Kaiama and Olli. Those interviewed at Faku practised pastoral transhumance. Less than 15% of the respondents had previous knowledge of human sleeping sickness. It was noted that

although examination of blood films (thin and thick) did not reveal any blood trypanosome, the transhumance pastoral mobility could be an important factor in any outbreak of human trypanosomiasis around Kainji Lake area in future.[28]

In a study conducted in May 1988 on sleeping sickness and tse-tse awareness among men and women living in the Luangwa Valley of Isoka District in the Northern Province of Zambia, respondents who had lived in the area for at least one month knew that tse-tse fly bites transmitted trypanosomiasis. Only people who lived in the area for less than one month believed that witchcraft and bad water transmitted sleeping sickness. There was a high level of fly awareness among all the respondents, regardless of duration of residence and age groups. Malaria was considered as the most serious illness in the community, and hence overshadowed the impact of trypanosomiasis in the community.[29]

In a similar study undertaken to determine the knowledge, attitudes and practices about sleeping sickness (human African trypanosomiasis) among communities living in and around Serengeti National Park Tanzania, most respondents knew about sleeping sickness, that its transmission occurred in the bush and forest through tse-tse bites during activities that exposed people to tse-tse flies like working in tse-tse infested bushes/forests, grazing livestock in tse-tse infested areas and hunting game animals. Respondents also knew the right place to seek healthcare. Most of the communities living in and around SENAPA were quite knowledgeable about tse-tse and sleeping sickness.[30]

In yet another study in D R of Congo**,** the level of knowledge, behaviours, practices and local beliefs about sleeping sickness among residents of the endemic zone of Kinshasa was assessed in a case control study. The level of knowledge of elementary concepts about trypanosomiasis was low among case-patients and the supernatural origin of trypanosomiasis was evoked such as divine, sorcery and transgression of rules. Many respondents call on churches for help. The study identified education level, age above

20yrs, males and travel to/living in endemic areas to be associated with the acquisition of knowledge of Human African Trypanosomiasis.[31]

Another conducted to assess the knowledge and level of individual and community participation in the control of Human African trypanosomiasis in Urambo District, western Tanzania showed that most respondents knew tsetse flies as the vector for HAT. Key informants reported that communities were aware of HAT and health risks associated with tse-tse bites in human. There was however, poor knowledge about the role played by animals in the transmission of HAT. The study concluded that the factors influencing individual and community participation included the knowledge of tse-tse, HAT and control measures.[32]

2.3. Risk factors for HAT

The main determinants of HAT transmission are the presence of the tse-tse fly supported by appropriate habitat and the presence of the mammalian reservoir host.[11, 33] Anthropogenic factors such as the location of villages, the main occupation of villagers (e.g. subsistence agriculture) and certain activities like fishing, washing clothes and contact with cattle are also thought to influence HAT transmission, though they have rarely been quantified. These factors ultimately determine the intensity of contact between the fly, reservoir animals and humans.[33]

1n a case-control study designed to analyze the characteristics of trypanosomiasis patients in Kinshasa and to compare them to those of healthy controls. Identified cases were concentrated in the outskirts and in the rural areas while few cases lived in urbanized areas. People in the labour market (aged 20-49 years) were most affected. HAT affected men and women equally. It also affected at higher rates people who moved around a lot and those who worked in rural or domestic activities, especially those who work in close contact with watercourses. In most case patients, sleep disorders were the identified as primary clinical

sign, also cervical lymphadenopathies and fever. Most respondents were diagnosed at a very advanced stage of infection. This showed that interventions on these modifiable or avoidable factors associated with HAT might make it possible to reduce the morbidity and mortality rates associated with HAT and prevent wider extension of this disease.[7]

A similar study was also conducted out to investigate behavioural and occupational risk factors for infection with HAT within villages in SE Uganda, and spatial risk factors in 4 high risk villages. In spatial analysis, the location of homesteads with one or more cases of HAT up to three years prior to the beginning of the study was compared to all non-case homesteads. Results showed that among other behavioural risk factors, having a family member with a history of HAT as well as proximity of a homestead to a nearby wetland area were strong risk factors for infection.[33][33]

In yet another study conducted in the Busia and Teso districts of Kenya, domestic dogs were screened to assess their role as sentinels for the occurrence of HAT. Five out of the 200 dogs screened were infected and blood from these naturally infected dogs were tested for the presence of the serum resistance associated gene in which one of them tested positive, confirming it as human infective.[34] This study identified that domestic dogs play a role in occurrence of HAT.

In another study on watering sites as an the major foci for transmission of gambiense sleeping sickness in an endemic gambiense sleeping sickness area in southern Sudan, the vegetation around 40 wells was categorised in terms of potential habitat for the vector, Glossina fuscipes, and the probability of repeated man/fly contact. Observations were related to the results of sleeping sickness surveys conducted using serodiagnostic CATT test. Riverine woodland and gallery forest were found to be the primary habitat of G. fuscipes and people using wells in this vegetation had higher infection rate compared to people using wells in open situations where the presence of G. fuscipes was unlikely.[35]

2.4. Prevalence of Human African Trypanosomiasis

The World Health Organization (WHO) Expert Committee on HAT Control and Surveillance held in 1995, in consideration of the huge uncertainties between the reported cases of HAT and the factual field situation, estimated that the true number of HAT cases was at least 10 times more than reported. Thus from the 30,000 reported cases annually, it was estimated that some 300,000 infected individuals remained ignored in the field.[36]

In 2005, the WHO regional committee for Africa during its fifty fifth session in Maputo, Mozambique, reported that HAT is endemic in 35 countries in the African Region with different levels of endemicity. Countries were classified as: (a) non-endemic with no case reported in five or more years; (b) unknown endemicity (0–25 new cases per year); (c) low endemicity (26–100 new cases per year); (d) moderate endemicity (101–500) new cases per year); (e) highly endemic or epidemic (more than 500 new cases per year).[12]

In 2006, WHO noted that *T. b. gambiense* caused most of the estimated 300,000-500,000 infections a year and Nigeria was classified as one of the countries reporting less than 100 cases of HAT a year[2] According to the WHO HAT surveillance and control programme in 2006, the estimated population of Nigerians at risk for sleeping sickness was 13,000,000 with transmission occurring in Delta State, where cases were regularly reported from the Abraka focus. The WHO HAT surveillance programme noted that it was difficult to assess whether transmission takes place elsewhere in the country given the lack of active surveillance.[37]

In a study conducted to analyse the trend of HAT in Nigeria from 1931 to 1990 using data from the records of epidemiological section of the Nigerian Institute for Trypanosomiasis Research (NITR), the first peak of HAT epidemic in Nigeria was identified to have occurred from 1931 to 1940, when more than 370,000 persons were diagnosed. By the end of 1950, the number of HAT cases reported had dropped to about 40,000, which further

declined to about 30,000 by the beginning of 1951. A slight increase in the number of cases was noted afterwards which was sustained up to the late 1970's. The period 1981-1990 witnessed a sudden upsurge in infection rates suggesting that the disease may be on the increase unnoticed.[38]

A similar study carried out on building the Atlas of HAT for the period 2000-2009 and mapping at village level of all new cases of HAT reported during the ten-year period (2000-2009) was conducted by WHO and presented for 23 out of 25 sub-Saharan countries that reported on the status of sleeping sickness during the ten year period. It was observed that Nigeria reported HAT cases from Edo and Delta States, where security constraints prevented more accurate surveys that could delineate the exact extent of the focus. During the period of study, Nigeria reported 119 new HAT cases.[39]

In a related study in 2007, the National Trypanosomiasis Control Program of the Democratic Republic of Congo (DRC) reported 8,162 cases of HAT. To address the problem of over- and underestimating the prevalence of HAT, a study was conducted in the same country to obtain accurate assessments of HAT prevalence using the Demographic and Health Surveys (DHS). Screening was conducted with ELISA and confirmation with trypanolysis and PCR. The study showed that a total of 18,592 people had HAT in the DRC 2007. This suggested that 56% of the actual HAT cases were not detected and therefore not reported very close to estimates of underreporting used by the WHO (65–75%).[40]

In yet another study conducted to determine the situation analysis of human African trypanosomiasis (HAT) in Zambia from January 2000 to April 2007, three districts namely, Mpika, Chama, and Chipata were found to be still reporting cases of HAT and thus lay in HAT transmission foci in North Eastern Zambia. During the period under review, 24 cases of HAT were reported from these three districts. Review of literature on the occurrence of HAT in Zambia from the early 1960s to mid 1990s revealed that HAT transmission foci

were widespread in Western, North Western, Lusaka, Eastern, Luapula, and Northern Provinces of Zambia during this period. The results showed that the distribution of HAT transmission foci was found to be so different in the period before and after 2000 when there was no active national tsetse fly and trypanosomiasis control program in Zambia.[41]

A related study was carried out in the Negage focus of the province of Uíge in northern Angola to assess the operational feasibility of detecting human African trypanosomiasis by active and passive case finding using the card agglutination test among patients presenting themselves to health centres with symptoms (passive case finding) and people actively screened in villages. Results showed that active case finding identified people with a positive card agglutination test result, of whom few had confirmed parasites. In those presenting for investigation majority had a positive card agglutination test result with parasites identified in their blood, lymph node fluid, or cerebrospinal fluid. A higher positive predictive value was identified for passive case detection compared to active case detection. It was noted that the card agglutination test though useful for initial screening in active detection of cases of human African trypanosomiasis, classically diagnosis is based on direct visualisation of parasites in the blood, lymph node fluid, or cerebrospinal fluid.[5]

2.5. Outcome of HAT Infection

In 2005, Jamonneau V.et al conducted a study to determine the outcome of untreated human infections caused by *T.b. gambiense* that has always been considered as invariably fatal. A cohort of HAT patients from the Ivory Coast among whom 11 refused treatment after their initial diagnosis were followed-up for 15 years. He observed that 10 out of 11 cases that had refused treatment had parasite clearance on microscopy and polymerase chain reaction (PCR). Most of these cases also displayed decreasing serological responses, becoming progressively negative to trypanosome variable antigens. He identified that apart from the "classic" lethal outcome of HAT, an alternative natural progressions of HAT may occur:

progression to an apparently aparasitaemic and asymptomatic infection associated with strong long-lasting serological responses and progression to an apparently spontaneous resolution of infection associated with a progressive drop in antibody titres as observed in treated cases. His findings demonstrated that a number of subjects displayed such infection courses hence he noted that recognising that trypanotolerance existed in humans, as was widely accepted for animals, would be a major step forward for future research in the field of HAT.[42]

2.6. HAT Prevention and control

On the prevention and control of HAT, the WHO between 1997 and 2006 conducted studies to determine response to HAT control measures and identified that in the *gambiense* form of sleeping sickness, intensive control activities should focus mainly on the human reservoir (the animal reservoir was considered to have only a minor impact on the transmission process). During the study period, the number of people under active surveillance increased, and the number of new cases decreased. However, control activities focusing on the human *T. b. rhodesiense* reservoir were found insufficient to control the disease, due to the role played by the animal reservoir on transmission. Thus, *T. b. rhodesiense* showed only a small decrease in the number of cases.[6]

2.7. Re-emergence of HAT

In a study conducted in Uganda 2007 on conflict and health, to identify the dominant impacts and vulnerabilities associated with conflict, their effects on the transmission of sleeping sickness and the resulting impact on sleeping sickness. The study showed that in conflict areas, decline of health services led to increased duration of human infections while reduced tse-tse control led to increased vector populations. Displacement of people and into marginal, bushy or swampy areas further increased human - fly contact. This showed that conflict had contributed to sleeping sickness risk.[27]

CHAPTER THREE - METHODOLOGY

3.1. Study Area

The Kachia grazing reserve (KGR) lies between latitudes 10^{o} 03' and 10^{o} 03' N and longitudes 7^{o} 55' and 8^{o} 06'E. It is 780m above sea level. It is found in Kachia Local Government Area (LGA) of Kaduna State (figure 1) about 90 kilometers from Kaduna town in North Western Nigeria. It is the major part of Ladduga district of Kachia LGA and has an area of 33,411 hectares of land. The grazing reserve lies within the sub humid zone, which is characterized by a dry season period from November to April and the rainy season from May to October. The vegetation consists of the typical Northern Guinea savannah Woodland. Rainfall ranges between 1000-1200mm per annum.[13]

The grazing reserve is divided into 6 blocks with 24 settlements which are communities with separate names. The settlement patterns are mainly hamlets and farm compounds[13]with vast grazing land for cattle herds. Their water sources include dams, running streams and hand dug wells. Each block has a school for nomadic education. There are two health clinics in the grazing reserve. One is owned by the government and the other is private. The health clinics are located in the central block called Nassarawa. A market is also situated in the central block of the grazing reserve.

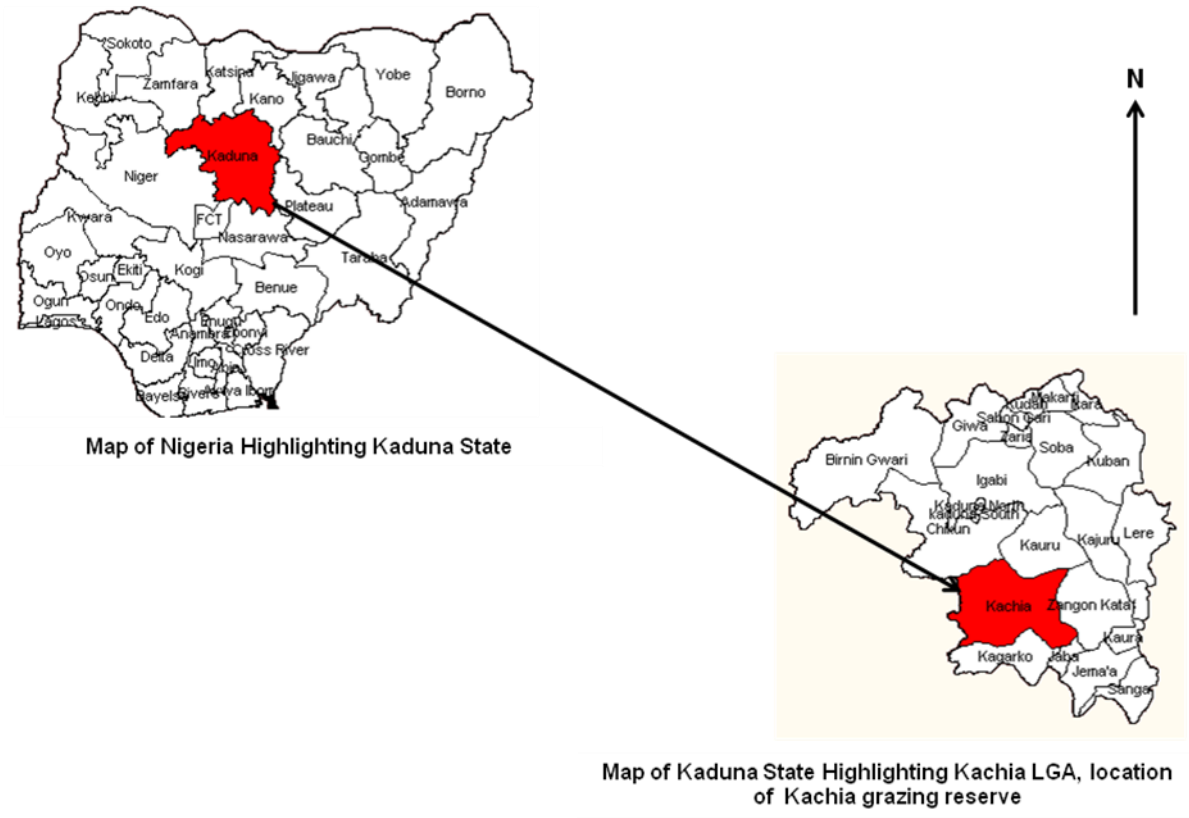

Figure 1: Map of Nigeria and Kaduna State, Showing the Study Area

3.2. Study Design

A cross sectional descriptive study was carried out.

3.3. Study Population

The study involved all the inhabitants of Kachia grazing reserve (above >5yrearsof age).The estimated population of the grazing reserve is about 24,500.[43] Most of the residents are cattle rearers and farmers. These cattle rearers are mostly Fulanis who move about with their animals from one area to another in search for pasture. Their main religion is Islam.

3.3.1. Inclusion Criteria

Residents of the grazing reserve who have been there for at least 1year and consented to participate in the study were included. This duration of stay would have predisposed them to the tse-tse flies as they move about their normal activities.

3.3.2. Exclusion Criteria

Residents of the grazing reserve who were absent during the period of study and residents that did not consent were excluded.

3.4. Sample Size Determination

Sample size determination for descriptve study[44] was used to calculate the sample size(n) as follows:

$$n = \left[\frac{Z\alpha^2 x\ P\ x\ (1-P)}{d^2} \right]$$

Where n = minimun sample size

P= prevalence of HAT in endemic focus of Delta state in Nigeria as documented by the Federal Ministry of Health[45] in 2006 was 10%.

d = precision (0.04)

Confidence limit was set at 95%

Level of significance (α) = 5%

Standard normal deviate (Zα) at 95% Confidence level = 1.96

$$n = \frac{(1.96^2 \times 0.1 \times 0.9)}{0.04^2} = 237$$

10% Non response estimate of 237 = 24

Minimum sample size (n) = 261

The sample size was rounded up to 300.

3.5. Sampling Technique

A multistage sampling technique was used with probability proportionate allocation of sample size. The grazing reserve was divided into six blocks. A list of settlements in all the six blocks was obtained.

Stage one: Settlements were randomly selected from each of the six blocks. The settlements were drawn proportionate to their sizes and consequently some blocks had three setllements selected while others had two settlements selected.

Stage two: In the second stage, households in selected settlements were systematically sampled for screening. The first household was randomly selected and the k^{th} household was then systematically sampled until the required number of sample was obtained. The sampling interval (k) was obtained by dividing the total number of households in the selected settlements (520) by the total number of households to be sampled (150). This gave the sampling interval of 4.

Stage three: In the third stage, a list of eligible members of a selected household was obtained and two members of the household were randomly selected by balloting.

To allocate samples proportionate to the population of the block, the proportionate samples in each block was calculated thus:

$$\frac{\text{Population of the block}}{\text{Total Population of the grazing reserve}} \times \text{Calculated sample size} \quad \text{(Appendix 4)}$$

3.6. Study Instruments

Questionnaire: the questionnaire which was interviewer administered had three sections with structured and semi structured questions. Section 'A' had the socio-demographic information of the respondents, section 'B' had questions on knowledge of HAT and section 'C' had questions on exposure to known risk factors for HAT transmission, practices relating to HAT prevention and health seeking behaviour by residents and for their animals (Appendix 1)

Card Agglutination Test for Trypanosomiasis(CATT) kits: This is a diagnostic test for the detection of HAT caused by *Trypanosoma brucei gambiense*. The test kits are manufactured by Foundation for Innovative Diagnostics under the Institute of Tropical Medicine, Belgium. The test detects the circulating antibodies that are produced following infection by *T.b. gambiense.* These antibodies can be demonstrated in whole blood, serum or plasma by agglutination tests. The test is carried out on plastic cards. One drop of whole blood or one drop of diluted plasma or serum from the patient is mixed with one drop of reconstituted CATT reagent. If antibodies are present, the antigen in the CATT reagent agglutinates within 5 minutes and this can be seen macroscopically (Appendix 2).

3.7. Data Collection Methods

Administration of questionnaire: Interviewers were research officers from NITR with a minimum qualification of National Diploma who were fluent in English and the local languages of Hausa and Fulfulde. A training was conducted on adminstration of the questionnaire in the local languages. The questionnaire was field tested in a settlement

closest to the grazing reserve for its applicability and corrections were made. Information was gathered on sociodemographic characteristics of respondents, knowledge on HAT, where to seeek medical help and practices relating to HAT prevention.

Clinical examination: Respondents were clinically examined for enlarged cervical lymph nodes around the neck of affected persons in a later stage of HAT.

CATT screening: Consented interviewed respondents were finger pricked to collect blood by laboratory scientists and then screened for HAT using Card Agglutination Tests for Trypanosomiasis (CATT) test kits.

3.8. Data Management

3.8.1. Measurement of Variables

Data was collected on socio demographic characteristics of respondents, knowledge of HAT (what HAT is, the causative agent, mode of transmission, signs and symptoms, prevention) and practices relating to HAT prevention among respondents.

Knowledge and practices: Knowledge of HAT by the respondents was graded on a scale into five domains. For each domain, a point was scored for correct response to a question and zero for wrong response with a maximum score of five and a minimum score of zero. Total score of 0 to 2 was graded as poor knowledge while score of 3 to 5 was good knowledge.

Exposure status: Known risk factors for HAT transmission were considered and residents exposed to two or more of these factors were regarded as being exposed to risk of HAT transmission.

HAT Prevalence: The HAT prevalence among the respondents was determined based on CATT positive test result. A case of HAT was any respondent that tested positive on CATT.

3.8.2. Statistical Analysis

Data collected was entered, cleaned and analysed using Microsoft excel 2007 and Epi-Info software version 3.5.3. Statistical analysis performed were univariate analysis for frequencies and proportions and bivariate analysis for exposures and factors related to the knowledge of the disease and preventive practices.

3.9. Ethical Consideration

Ethical clearance was obtained from the Ahmadu Bello University, Ethical Committee and the Kaduna State Ministry of Health. A meeting was held with the community leaders to sensitize them for their support and also to mobilize the community for the activity and cooperation. Permission was also obtained from the district head of Ladduga. Informed consent was obtained from respondents and from parents of minors in addition to ascent before the study and data confidentiality was maintained by keeping the questionnaire that had the respondents name with the researcher alone, not releasing any information regarding respondents and only entering questionnaire numbers in the data base. Informed consent was also obtained from caregivers of respondents less than fifteen years. A mobile clinic was set up whereby residents with minor ailments were consulted by a medical Doctor and treatment prescribed for them. Health education was also conducted at the end of the exercise on HAT and disease prevention while HAT pamphlets distributed.

3.10. Limitations

1. Sensitivity of the CATT reagent (92% - 98%).[26]
2. Recall bias among respondents
3. Absenteeism of eligible respondents

CHAPTER FOUR - RESULTS

4.1. Baseline Socio demographic data

The socio demographic data of respondents is shown on tables 1 and 2.

Table 1: Age group Distribution of Respondents (n=300).

Variable	Frequency	Percent (%)
Mean age 39±17years		
Age Group(Years)		
<40	188	62.7
≥40	112	37.3
Sex		
Female	131	43.7
Male	169	56.3
Marital Status		
Single	35	11.7
Married	259	86.3
Widowed	5	1.7
Divorced	1	0.3
Educational Qualification		
No Formal Education	199	66.3
Primary	57	19.0
Secondary	38	12.7
Post Secondary	6	2.0
Occupation		
Farming	14	4.7
Husbandry	133	44.3
Trading	87	29.0
Artisan	18	6.0
Civil Servant	6	2.0
Unemployed	42	14.0
Tribe		
Fulani	280	93.3
Hausa	20	6.7

The mean age of respondents was 39 ± 17years and 62.7% of respondents were below forty years and majority (56.3%) were males. Most respondents (86.3%) were married; only 14.7% secondary and post secondary education and majority 44.3% practiced mainly animal husbandry as a means of livelihood. Most (93.3%) of respondents were Fulanis and the mean duration of residence in the grazing reserve was 22 (± 8years), range of 1-33years.

4.2. Knowledge of HAT

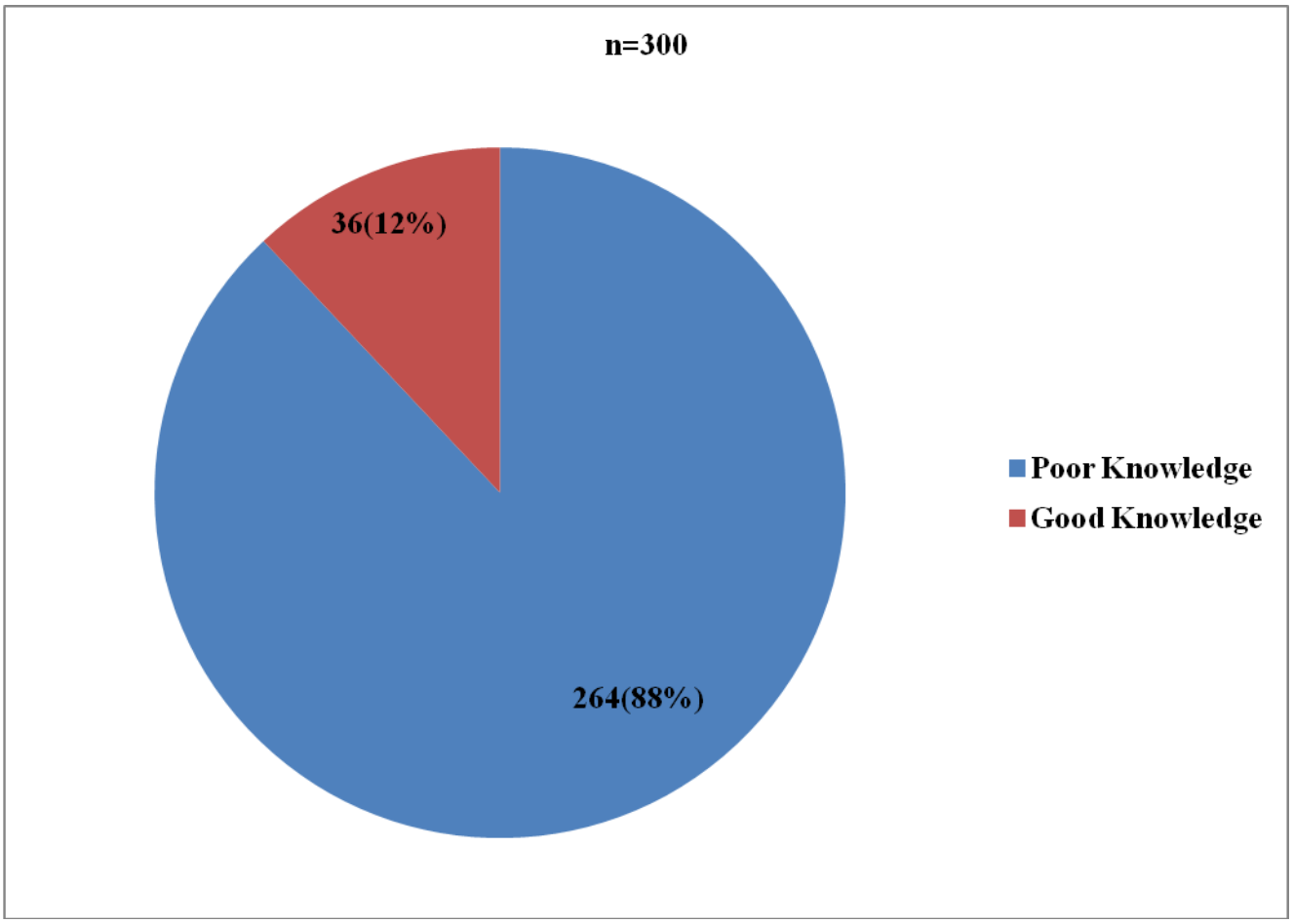

Figure 2: Knowledge of HAT among Respondents

Based on knowledge scoring, only 36(12%) respondents had good knowledge of HAT as shown on figure 2.

Table 2: Distribution of Knowledge of HAT among Respondents.

Variable	n	Percent (%)
What is HAT	300	18.7
Signs and Symptoms of HAT	300	18.7
Causative agent	300	17.3
Mode of transmission	300	12.0
Prevention	300	18.7

Respondents' knowledge on the different aspects of the disease showed that knowledge of what HAT is and its signs and symptoms was highest 56(18.7%).

4.3. Exposure to risk factors for HAT transmission

Exposure to predisposing factors for HAT was quite prevalent among respondents. Two hundred and twenty nine (76.3%) respondents were exposed to at least two or more risk factors.

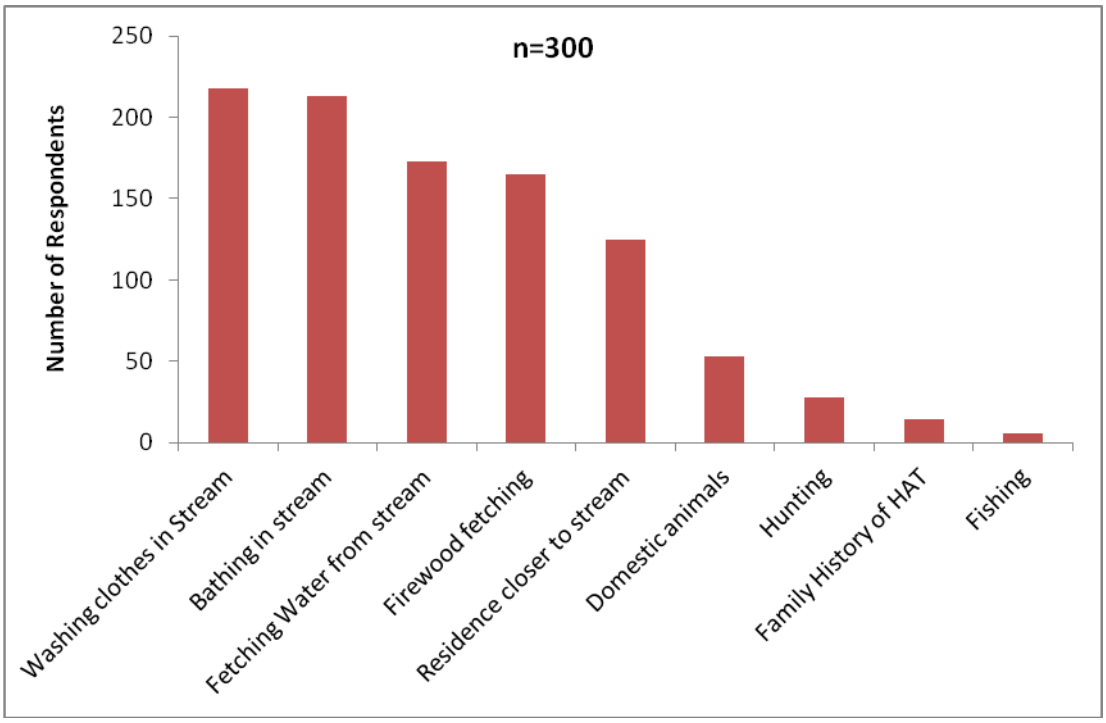

Figure 3: Distribution of Exposure to Risk Factors among Respondents

The commonest exposure were washing clothes in the stream (72.7%), bathing in the stream (71.0%), fetching water from the stream (57.7%) and fetching of firewood from the bush (55.0%).

Table 3: Frequency of Exposure to HAT Risk Factors among Respondents

Activities	n	Exposed (%)	Frequency of exposure (%)		
			Daily-Weekly	Monthly	Occasionally
Bathing in stream	300	213(71.0)	186(87.3)	3(1.4)	24(11.3)
Firewood Fetching	300	165(55.0)	144(87.3)	8(4.8)	13(7.9)
Fishing	300	6(2.0)	3(50.0)	1(16.7)	2(33.3)
Hunting	300	28(9.3)	15(53.6)	2(7.1)	11(39.3)
Washing Clothes in Stream	300	218(72.7)	187(85.8)	5(2.3)	26(11.9)
Fetching Water from Stream	300	173(57.6)	153(88.4)	5(2.9)	15(8.7)

A higher proportion of respondents were exposed to these risk factors on a daily to weekly basis.

4.4. Prevalence of HAT

Of the 300 respondents that were examined and screened for HAT, none had palpable cervical lymph nodes enlargement and none tested positive on CATT; hence HAT prevalence was zero.

4.5. Practices relating to HAT prevention

Table 4: Practices Relating to HAT Prevention among Respondents

Practices	n	Percent
Bush clearing around houses	300	99.0%
Usage of protective clothing when visiting tse tse infested areas	300	41.0%
Usage of ITNs	300	75.7%

Respondents often indulge in different practices to avoid contact or being beaten by tse-tse flies. These ranged from clearing of overgrown bushes around their houses (99%) to use of insecticidal treated nets (ITNs) (76%) and use of protective clothing when visiting the bush (41%).

Table 5: Health Seeking Behaviour among Respondents (n=300)

First Point of call when Ill	Frequency	Percent (%)
Hospital	120	40.0
Herbalist	1	0.3
Chemist	2	0.7
Don't Know	177	59.0
Total	**300**	**100.0**

One hundred and twenty (40.0%) respondents would seek medical help in the hospital if ill while majority of them 177(59.0%) didn't know where to seek medical help.

Table 6: Health Seeking Behaviour for Sick Animals among Respondents (n=232)

What is done with Sick Animals	Frequency	Percent (%)
Consult Veterinarian for treatment	217	93.5
Treated them with herbs	4	1.7
Sell/Slaughter	6	2.6
Don't Know	5	2.2
Total	**232**	**100.0**

Majority of respondents (93.5%) who had animals with trypanosomiasis sought treatment from a veterinarian while only 2.2% did not know what to do with their sick animals.

4.6. Determinants of knowledge of HAT and prevention practices

Table 7: Knowledge of HAT by Socio- demographic Characteristics of Respondents (n=300)

Variable	Knowledge		Odds Ratio (95% CI)	p-value
	Good (%)	Poor (%)		
Sex				
Male	30(83.3)	139(52.7)	4.5(1.7 – 12.5)	0.0009
Female	6(16.7)	125(47.3)		
Educational Qualification				
Educated (Secondary & post)	14(38.9)	30(11.4)	5.0(2.3-10.7)	0.00003
Not educated (none & primary)	22(61.1)	234(88.6)		
Age group				
≥40yrs	21(58.3)	91(34.5)	2.66(1.31-5.41)	0.009
<40yrs	15(41.7)	173(65.5)		
Occupation				
Farming/Husbandry	23(63.9)	124(47.0)	2.0(1.00-4.11)	0.08
Others	13(36.1)	140(53.0)		

Male respondents were 4.5 times more likely to have good knowledge of HAT compared to their female counterparts.

Respondents that had secondary and post secondary qualifications were 5.0 times more likely to have good knowledge compared to those with only primary school qualification and no formal education.

Respondent's ≥40years were 2.7 times more likely to have good knowledge compared to those less than 40years.

Table 8: Knowledge of HAT by Socio-demographic Characteristics of Respondents (continued)

Variable	Knowledge		Odds Ratio (95% CI)	p-value
	Good (%)	Poor (%)		
Duration of stay in the area				
>2yrs	27(75.0)	136(51.5)	2.82(1.28-6.23)	0.01
≤2yrs	9(25.0)	128(48.5)		
Knowledge of AT				
Good	24(66.7)	117(44.3)	2.51(1.21-5.24)	0.02
Poor	12(33.3)	147(55.7)		
Family History of HAT				
Yes	6(16.7)	8(3.0)	6.4(2.08-19.70)	0.001
No	30(83.3)	256(97.0)		

Respondents that have resided in the grazing reserve for ≥2 years were 2.8 times more likely to have good knowledge of HAT compared to those that have stayed for less than two years.

Respondents that had good knowledge of AT were 2.5 times more likely to have good knowledge of HAT compared to those that did not know about AT.

Respondents with history of having had a family member suffered from HAT in the past were 6.4 times more likely to have good knowledge of HAT compared to those with no family or past history of HAT.

Table 9: Unconditional Logistic Regression Factors Associated with Knowledge of HAT among Respondents.

Variable	Adjusted OR	95% CI	P- Value
Male	5.0	1.8, 13.6	0.002
Age ≥ 40years	5.0	1.0, 24.4	0.05
Family history of HAT	8.7	2.4, 32.1	0.001
≥2years of Residence	2.2	1.0, 5.1	0.06

Male respondents (OR 5.0), respondent's ≥40years of age (OR 5.0) and respondents with history of having had a family member suffered from HAT in the past (OR 8.7) were independent factors significantly associated good knowledge of HAT.

Table 10: Factors Associated with HAT Preventive Practices among Respondents (n=300)

Variable	Prevention Practices		OR(CI)	P Value
	+VE	-VE		
Knowledge of HAT				
Good	33(67.3)	3(1.2)	170.5(47.2-616.6)	0.000
Poor	16(32.7)	248(98.8)		
Sex				
Male	40(81.6%)	129(51.4%)	4.2(1.9 – 9.7)	<0.001
Female	9(18.4%)	122(48.6%)		
Education				
Educated	18(36.7)	26(10.4)	5.0(2.5- 10.2)	<0.001
Not educated	31(63.3)	225(89.6)		
Age Group				
>40	27(55.1)	85(33.9)	2.40(1.29-4.46)	0.008
≤40	22(44.9)	166(66.1)		
Occupation				
Farming/Husbandry	30(61.2)	117(46.6)	1.81(0.97-3.38)	0.09
Others	19(38.8)	134(53.4)		

Respondents who had good knowledge of the HAT were 170 times more likely to practice preventive measures compared to those with poor knowledge. Male respondents were 4.2 times more likely to practice preventive measures compared to females.

Respondents that had secondary and post secondary qualifications were 5.0 times more likely to practice prevention measures compared to those with only primary school qualification and no formal education and respondents ≥40years were 2.4 times more likely to practice HAT preventive measures compared to those less than 40years.

Table 11: Factors Associated with HAT Preventive Practices among Respondents (continued)

Variable	Prevention Practices		OR(CI)	P Value
	+VE	-VE		
Duration of Stay				
>2yrs	37(75.5)	126(50.2)	3.06(1.52-6.14)	0.002
≤2yrs	12(24.5)	125(49.8)		
Knowledge of AT				
Good	29(59.2)	112(44.6)	1.80(0.92-3.35)	0.09
Poor	20(40.8)	139(55.4)		
Family History of HAT				
Yes	7(14.3)	7(2.8)	5.81(1.94-17.41)	0.002
No	42(85.7)	244(97.2)		

Respondents that had resided in the grazing reserve for ≥2 years were 3.1 times more likely to practice prevention measures compared to those that have stayed for less than two years. Respondents with history of having had a family member suffered from HAT in the past were 5.8 times more likely to practice prevention measures.

Table 12: Unconditional Logistic Regression Factors Associated with HAT Prevention Practices among Respondents.

Variable	Adjusted OR	95% CI	P- Value
Male	4.2	1.8, 10.0	0.001
Family history of HAT	6.7	1.9, 23.7	0.003
≥2years of Residence	2.9	1.4, 6.2	0.006
Education (above Primary school level)	4.4	2.0, 9.6	0.0002
Age ≥40yrs	4.1	1.0, 17.4	0.06

Male respondents (OR 4.2), family history of HAT (OR 6.7), educational qualification above primary school level (OR 4.4) and residing in the grazing reserve for ≥2years (OR 2.9) were also identified to be individually associated with implementation of practices relating to HAT prevention among respondents.

CHAPTER FIVE - DISCUSSION

This study looked into the knowledge and prevalence of HAT among residents of Kachia grazing reserve and practices among residents relating HAT prevention. Majority of the respondents of the Kachia grazing reserve had poor knowledge of HAT and were mostly exposed to risk factors for the disease. The prevalence of HAT among residents of the Kachia Grazing reserve of Kaduna State was zero. Respondents frequently engaged in common practices related to HAT prevention.

The socio demographic characteristics of respondents showed that majority of respondents are Fulanis. This is typical of a grazing reserve meant for animal husbandry in Nigeria. Male predominance is typical of most studies in sub Saharan Africa with majority of respondents in the active age group 20-49years. Participation of females was reasonably high, probably due to the socialization of an average Fulani woman as they do interact freely with the public while carrying out their trade. The educational qualification of respondents showed that most of them do not have formal education, only 14.7% had secondary and post secondary education. This is far below the national adult literacy level.[46] A review of marital status of respondents showed that majority are married. This is a common practice amongst the fulanis where marriage is a rule, and they do so very early in life. The occupational status of respondents showed that most of them are cattle rearers[28] which is expected of a grazing reserve. Majority of the female respondents were into trading. This is the normal trade of Fulani women in cows' milk called ''Fura da Nunu'' in local language. Most residents have resided in the grazing reserve for two or more years. This is because grazing reserves in Nigeria are areas demarcated by government for grazing where Fulanis can settle permanently without being disturbed by farmers.[47]

A review of general knowledge of HAT showed that respondents' knowledge of HAT was poor. This is similar to studies conducted on HAT among nomadic Fulanis in Northern

Nigeria in which knowledge of the disease was poor.[28] Also similar to a related study in the DR Congo in which knowledge, behaviours, practices and local beliefs about sleeping sickness among residents of the endemic zone of Kinshasa was assessed and knowledge was poor among the respondents.[28, 31] The poor knowledge among residents shows that even though they are exposed, they are not aware of risk associated with the exposure. A detailed review of knowledge of HAT commonly known as 'Ciwon bachi' in local language showed that knowledge of the causative agent, the mode of transmission and symptoms of HAT was quite poor. This is however, contrary to a similar study conducted in the tsetse and trypanosomiasis endemic communities of Zambia on sleeping sickness and tsetse awareness in which most of the respondents who had lived in the area for at least one month knew that tsetse fly bites transmitted trypanosomiasis[29] and in a related study in the Serengeti National Park Tanzania, most residents knew sleeping sickness, the right place to seek healthcare and that sleeping sickness infections were acquired in the bush and forest through a tsetse bite.[30] Both studies showed that knowledge of HAT was quite high among respondents. In this study, the lack of good knowledge could be due to non endemicity of the disease in the reserve since no institutionalized measures had been put in place to enlighten the residents about the disease and its prevention and control measures. Despites the poor knowledge of HAT, a greater proportion of respondents of the grazing reserve had satisfactory knowledge of AT as lots of work on animal trypanosomiasis has been going on in the grazing reserve.[13, 48]

The association of gender, age of respondents, duration of stay at the reserve and family history of HAT with knowledge of HAT and implementation of preventive practices is quite similar to the Kinshasa study [31] in which males, adults and residence in an endemic area for more than 3months were associated with knowledge of HAT.

Exposure to known risk factors that could predispose residents to HAT was reviewed among respondents. Risk factors explored were engagement in activities like farming, hunting, fishing, fire wood fetching in an area infested by tse-tse flies that have been documented.[2, 8, 11, 33] Water contact activities such as washing clothes/bathing in the stream or fetching water believed to carry a high risk for HAT infection due to the proximity to the vector habitat were also considered.[49] A detailed review of exposure to predisposing factors for HAT showed that majority of respondents were exposed to at least two or more factors. Most respondents exposed were aged 20- 49 years who are the active population in the labour market and move around a lot in the reserve as they graze their animals, farm and perform other rural and domestic activities similar to the study in Kinshasa.[7] Mostly male respondents were exposed than females. This is likely due to the engagement of males in the Northern part of the country in most outdoor activities while the females stay indoor though studies have shown that there is no gender difference in exposure.[7] Respondents frequently engaged themselves in activities like washing in the stream, bathing in the stream, firewood fetching and hunting which exposed them to contact and possibly bites by tse-tse flies.

Review of HAT prevalence in the grazing reserve following CATT screening showed zero prevalence of HAT among the respondents even though there had been reported episodes of contact and bites by tse-tse flies. This is similar to a prevalence study conducted in Northern Nigeria among migrant fulanis around Lake Kainji area on HAT in which no case was recorded even though it was noted that the transhumance pastoral mobility of these migrant fulanis could be an important factor in any outbreak of human trypanosomiasis around Kainji Lake area in future.[28] Considering non infectivity of the vector as a possible explanation, only tse-tse infected with *T. brucei gambiense* causative agent for the gambiense form of HAT can transmit infections to humans following bites[12]. This is

supported by the report of a survey on sero prevalence of AT in the grazing reserve in 2009 in which vector parasitology showed that the vector (tse-tse) were not infected with *T.b. gambiense* rather, they harboured the infective agents for AT (*T. vivax, T. congolense and T. b. brucei*) that had led infection of animals with high AT prevalence recorded.[48] The presence of domestic animals in the reserve and the role played by these domestic animal reservoirs in parasite transmission of HAT to humans has been documented to be unclear as to whether they increase the transmission to human or on the contrary act as bait thus providing some degree of protection[16] to human and needs to be further evaluated.

Also to be considered is the genetic susceptibility of an individual to infection which is controlled by genetic factors from the host or by the parasite's virulence.[17] The existence of an individual susceptibility to HAT known as trypanotolerance[18], [19] has been suspected and documented. Trypanotolerance which has been well described in animal trypanosomiasis[16, 20] appears to also occur in humans as some individuals are able to somehow control *T. b. gambiense* infections.[16] This phenomenon probably may have occurred among residents of the grazing reserve who at one time might have been infected, got to control the infection and became self cured hence the negative test results. This could possibly explain the zero prevalence detected in the reserve. This is also supported by the study conducted by Bucheton et al on the long-term follow-up of 11 HAT case patients that refused treatment in Côte d'Ivoire for fifteen years which led to the identification of these cases who were initially diagnosed in first stage by microscopy, yet on follow-up examination had no detectable clinical symptoms and no detectable parasitaemia by microscopy. Subsequent long-term follow-up showed a drop in antibody titres to sero negative levels in these cases, indicating that they had self-cured.[16]

Also, studies on human genetic factors influencing infection by *T. b. gambiense* looked at polymorphisms in cytokine genes and the development of HAT. These studies showed, on

one hand, a significant association with polymorphisms located in the IL-6 and IL-10 genes and a decreased risk of developing HAT and, on the other hand, a significant association between polymorphisms located in the IL-1*a* and TNF-*a* genes and an increased risk of developing the disease.[16, 50, 51] This needs to be examined further in this context of zero prevalence obtained in the grazing reserve.

Findings from the study revealed that practices relating to HAT prevention are common among almost all of the residents especially the usage if ITNs. This could also explain the non prevalence of HAT amongst them as they often protect themselves from tse-tse bites.

A review of common practices to avoid contact or being beaten by tse-tse flies among respondents showed that clearing of overgrown bushes around their houses was a common practice in almost all of the respondents. This was aimed at preventing infestation of these areas by tse-tse flies. Also majority of respondents used insecticidal treated nets (ITNs) in their homes and protective clothing when visiting the bush and tse-tse infested areas for hunting or grazing. Even though respondents' knowledge of the disease cause by the vector was poor, they still put in adequate preventive measures to protect themselves from this vector that transmit disease. This is similar to the finding reported in the study conducted on HAT in communities around the Serengeti Park in Tanzania.[30] These are preventive measures that are advocated for HAT disease prevention and control.

A review of the health seeking behaviour among respondents showed that some respondents knew that the right place to seek healthcare was the hospital if ill as had been documented in similar studies in the Serengeti Park in Tanzania.[30] Notably was the finding that most of respondents did not know where to seek medical help if ill. This finding is contrary to studies in Kinshasa DR Congo whereby a greater proportion of respondents would resort to churches for help because of their belief in the supernatural cause of HAT.[31] In the case of health seeking behaviour for their sick animals, almost all respondents would seek help

from a veterinarian for their sick animals and only a few reported doing nothing to their sick animals. These are pastoralists who place their animals at very high esteem.

CHAPTER SIX- CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

In this study we can conclude that Knowledge of HAT among residents of Kachia grazing reserve is poor and most of the residents are exposed to risk factors for disease transmission in the reserve. The prevalence of HAT Kachia grazing reserve is zero and a lot of measures relating to HAT prevention are being put in place by residents including: clearing of overgrown bushes around their houses, use of insecticidal treated nets and wearing protective clothing when visiting areas infested by the insect vector on a daily basis to prevent themselves from the disease that these vectors could possibly transmit including HAT. This calls for concerted efforts both at the national, state and local government levels including the relevant line ministries to put in place vector control measures to avert future occurrence of disease outbreak in the grazing reserve. The role of domestic animals in T. *b. gambiense* infection needs to be further studied.

6.2. Recommendations

In order to improve the knowledge of HAT in the reserve and practices relating to HAT prevention and in order to prevent future occurrence of HAT in the reserve, the following recommendations are made:

1. The State Ministry of Health in collaboration with all stakeholders should organize mass sensitization campaigns on a regular basis to enlighten the residents on the disease HAT and its preventive measures to prevent future outbreak of HAT in event of any introduction of the disease into the grazing reserve.
2. Institute of trypanosomiasis research should conduct more research on the specie of tse-tse flies, their status of infectivity to humans and also identify possible factors responsible for host susceptibility to HAT infection in the grazing reserve.

3. Ministry of Agriculture should intervene and implement measures to control tse- tse flies in the grazing reserve.

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APPENDICES

Appendix 1:

QUESTIONNAIRE ON SLEEPING SICKNESS SURVEY

S/N: _____

Introduction:

Good day, dear respondent;

My name is ---------- from the Ministry of health. We are conducting a study to determine the prevalence of sleeping sickness and the factors associated with sleeping sickness. The result of the study will assist the community and government to institute effective measures to prevent and eliminate sleeping sickness from this community. I want to ask you a few questions on your knowledge, attitude and practice as well as other factors related to sleeping sickness infection. All your responses will be treated with outmost confidentiality. I will appreciate if you can spend 15minutes talking with me. Your participation is voluntary and you may decide not to participate if you wish; however your participation will be highly appreciated.

Do I have your permission to continue?

- ☐ Yes
- ☐ No

If yes, proceed

Thumb Print/signature of respondent----------

A. Socio-demographic information

1. Name: ----------

2. Sex:

   ☐ Male

   ☐ Female

3. Age(years) ----------

4. Name of settlement ----------

5. What is your religion?

   ☐ Christianity

   ☐ Islam

   ☐ Traditional religion

   ☐ Others (specify) ----------

6. What is your marital status?

   ☐ Single

   ☐ Married

   ☐ Cohabiting

   ☐ Widowed

   ☐ Divorced

   ☐ Separated

7. What is your highest level of formal education?

- ☐ No formal education
- ☐ Primary
- ☐ Secondary
- ☐ Post- secondary

8. Occupation (What work do you do to earn a living**?)**

- ☐ Farming
- ☐ Husbandry (Cattle raring)
- ☐ Trading
- ☐ Artisan/Labourer (builder, bricklayer, mechanic, tailoring, shoe maker, blacksmith, carpenter, electrician etc)
- ☐ Civil Servant
- ☐ Unemployed

9. What is your tribe (Please Specify***)*** ----------

B. Regarding Knowledge about sleeping sickness

1. What is sleeping sickness ----------
2. What is the cause of sleeping sickness (Do not read the options)?

- ☐ Micro-organism
- ☐ Witchcraft/supernatural
- ☐ Consumption of bad water
- ☐ Others (please specify) ----------
- ☐ Don't Know

3. How is sleeping sickness transmitted (how can one be infected)

- ☐ Bite from infected mosquito
- ☐ Bite from infected tsetse flies
- ☐ Witchcraft/supernatural
- ☐ Consumption of bad water
- ☐ Don't know

4. How can you protect yourself from sleeping sickness

- ☐ Wear protective clothing
- ☐ Use Insecticide Treated Nets
- ☐ Clear bushes around the house
- ☐ Use insecticides
- ☐ Others (specify) ----------
- ☐ 6. Don't Know

5. Do you have insecticide treated nets (ITNs) in your home?

- ☐ Yes
- ☐ No

6. How often do you use/sleep under the nets**

- ☐ Every night
- ☐ Rarely
- ☐ Never

7. What are the signs and symptoms of sleeping sickness (indicate all that applies) **

- ☐ Fever
- ☐ Itching
- ☐ Weight loss
- ☐ Sleep disorders
- ☐ Swellings of lymph nodes
- ☐ Others (Please specify) ----------
- ☐ Don't Know

8. If you have sleeping sickness disease, where will you seek for medical help?

- ☐ From the hospital
- ☐ From a herbalist/native doctor
- ☐ From a Mosque/church
- ☐ From a Chemist
- ☐ Self medication
- ☐ Don't know

C. Risk factors and Prevention

9. For how long have you been here? (Specify in years) ----------

10. Do you indulge in any of these activities (Indicate as most appropriate)

	Yes	No
Fishing	☐	☐
Hunting	☐	☐
Fetching of Fire wood	☐	☐
Fetching of water from the stream	☐	☐
Washing of clothes in the stream	☐	☐
Bathing in the stream	☐	☐

11. How often do you indulge in these activities?(Tick as appropriate)

	Weekly	Monthly	Occasionally
Fishing	☐	☐	☐
Hunting	☐	☐	☐
Fetching of Fire wood	☐	☐	☐
Fetching of water from the stream	☐	☐	☐
Washing of clothes in the stream	☐	☐	☐
Bathing in the stream	☐	☐	☐

12. How many minutes do you walk to the stream from your house?

☐ Less than 5minutes

☐ Greater than five minutes

13. Has any member of your family ever had sleeping sickness?

- ☐ Yes
- ☐ No

14. If yes, what was done to the person? **

- ☐ Taken to hospital
- ☐ Taken by herbalist
- ☐ Sought spiritual healing (mosque/church)
- ☐ Treated by chemist
- ☐ Had self treatment
- ☐ Don't know

15. Do you have domestic animals in your compound?

- ☐ Yes
- ☐ No

16. If yes, which ones? (indicate all that applies)**

- ☐ Goats/sheep
- ☐ Cows
- ☐ Dogs
- ☐ Pigs
- ☐ Others (specify) ----------

17. Have you ever had animals with nagana (Samore)?

- ☐ Yes
- ☐ No

18. If yes which animals- (list them)** ----------

19. What are the symptoms of trypanosomiasis (Nagana / Samore) in animals?

- ☐ Wasting
- ☐ Poor appetite
- ☐ Diarrhoea
- ☐ Others(please specify) ----------

20. What was done to the animals?

- ☐ Treated by a Veterinarian
- ☐ Treated with local herbs
- ☐ Sold/slaughtered
- ☐ Don't know

21. Do you use protective clothing when you go out to the bush/stream?

- ☐ Yes
- ☐ No

22. Do you clear bushes around your house?

- ☐ Yes
- ☐ No

23. If yes, how often**

- ☐ Every time it grows
- ☐ Once a while

24. How often have you had malaria like symptoms

- ☐ frequently (every 3-6months)
- ☐ rarely (once a year)

25. Do you seek medical help if ill?

- ☐ Yes
- ☐ No

26. If yes, where do you seek for medical help?

- ☐ Hospital
- ☐ Herbalist
- ☐ Sought spiritual healing (mosque/church)
- ☐ Chemist
- ☐ Had self treatment
- ☐ Did nothing

Thank the Respondent

Interviewer's Name, Signature _____

Supervisor's Name, Signature _____

Appendix 2: Protocol for CATT Screening

Reagent

Card Agglutination Test for Trypanosomiasis **(**CATT) test kits which contains:

1. CATT Reagent – Stabilized freeze-dried suspension of fixed, stained trypanosomes.
2. CATT Buffer - For reconstitution of CATT reagent, control sera and for dilution of test samples. Preservative used is 0.1%sodium azide.
3. Positive and Negative controls.
4. CATT accessories i.e. CATT cards, applicator sticks, droppers, capillary tubes, rubber teats syringe and needle

Reconstitution of the reagent (CATT)

Using the syringe provided, 2.5 ml of the buffer is taken and added to one vial of reagent. This is mixed by turning the vials gently. It is allowed to stand for a few minutes. The reconstituted reagent must be kept in the refrigerator and used for a maximum of 7 days.

Reconstitution of the Controls

Using separate syringes 0.5 ml of the buffer is taken and added to the control vials. It is mixed by turning the vials gently. It is the allowed to stand for a few minutes.

Reagent quality control (QC)

All newly reconstituted reagents must be tested against known positive and negative controls for quality control. Quality control for the reagents was conducted as follows: The rubber caps of the vials of the CATT reagents and controls were removed and droppers were fitted to each of them. On the CATT card the test area was labelled; one positive (**+ve**) and one negative (**-ve**). A drop of the well-mixed CATT reagent was added to each of the test areas. A drop of the positive control was added to the test area marked positive (**+ve)** and mixed with the CATT reagent using the applicator stick to spread the mixture over the whole test area as marked on the card. A drop of the negative control was also added to the test area marked negative (**-ve)** and mixed with the CATT reagent using the applicator

sticks, and the mixture spread on the whole test area as marked. The CATT card with the positive and negative control specimens was placed on the rotator and rotated for 5 minutes at 60 revolutions per minute (rpm). The specimens were then observed macroscopically for agglutination.

Positive control - Agglutination occurred within 5 minutes

Negative control - No Agglutination occurred after 5 minutes.

The results of the control specimen were correct and the reagents good to be used.

N/B: If the results are not ok, a new reagent should be reconstituted test repeated and if the second reagent results are not ok, a new reagent should be opened and QC repeated.

Procedure for collection of blood from Participants

Capillary blood was collected because only a small quantity of blood is needed for CATT screening. Area to collect the sample: Fingers.

Items needed for capillary blood collection:

Non-sterile gloves, Disinfectant, Cotton wool and Sterile lancet

Procedure

The procedure was explained to the respondent.

Sterile gloves were worn.

The side of the ball of the finger was identified.

The area was cleaned with a cotton swab soaked with disinfectant.

Using the sterile lancet, the disinfected area was pricked once and fast.

The used lancet was disposed into a sharps container.

The first drop of blood was wiped off using a dry cotton swab.

The area was pressed again to get a fresh drop of blood.

The drop was placed in the appropriate collection vessel (Slide, capillary tube)

The patient is then given a dry cotton swab to press the puncture site to prevent further bleeding.

Requirements for CATT test:

Marker

Capillary tube holder

CATT reagents and accessories

Rotator with power supply

Procedure for CATT screening

At the bottom right side corner of the CATT card, the participant's numbers to be performed were written on the card (e.g. 1 – 10, 11 – 20, 21 – 30 etc). A drop of the CATT reagent was added onto each of the test areas as per the number of specimens to be tested on a card.

Blood from the capillary tube was dispensed on the appropriate test area next to the drop of reagent using a dispenser. Both were mixed using the applicator sticks and spreading the reaction mixture on the whole test area. (The applicator stick was thoroughly wiped using dry cotton wool or gauze between each specimen mixed). The CATT card was placed with the reaction mixture in the rotator and was rotated for 5 minutes. It was then observed for agglutination. The results were recorded thus:

Agglutination – Positive test

No Agglutination - Negative test

The used CATT cards were discarded in the waste container and the capillary tubes in the sharps container.

Appendix 3: Participant Information

DEPARTMENT OF COMMUNITY MEDICINE,

AHMADU BELLO UNIVERSITY, ZARIA

RESEARCH ON PREVALENCE OF SLEEPING SICKNESS AMONG RESIDENTS OF KACHIA GRAZING RESERVE.

Dear Parent/Guardian,

Introduction:

My name is Uba Belinda from Ahmadu Bello University, Zaria/Nigeria Field Epidemiology and Laboratory Training Programme of the Federal Ministry of Health, Abuja. We are undertaking a research to find out the prevalence of Sleeping sickness among residents of this community. Sleeping sickness is a disease that affects everyone exposed to bites from infected tsetse flies and could be fatal if left untreated. Affected persons do not exhibit signs of the disease until the late stage when treatment outcome is poor. People who practice grazing, hunting, farming and visit the bush for firewood fetching and other activities are at higher risk of being bitten by tsetse flies that transmits this disease. Affected persons result to low productivity and drop out from school among affected children. We expect to have 300 people screened for this disease.

We are undertaking this study to determine the presence of sleeping sickness in this community and that will aid the government in putting in place treatment of cases, prevention and control activities to address the situation. In order to carry out this activity, we will visit compounds and randomly select people from households. These people will be asked some questions before testing them for sleeping sickness.

Is participation in this study compulsory?

Participation in this study is voluntary. You are free to or not to participate in the study or to leave the study at any stage. However, we will greatly appreciate it if you will be part of this study as your participation will help in understanding the real situation of sleeping sickness in this community. If you choose not to join, you will not be denied any of the services that you normally receive.

Administration of Questionnaire and Testing:

Laboratory scientist will collect just a drop of blood samples from a finger prick on the selected person. The sample will then be tested for sleeping sickness right there on site and results made known to you in about 10minutes. A sterile instrument (lancet) will be used to prick your finger after cleaning the area with a disinfectant. You will not be charged any money for the test. If tested positive, another blood will be taken to confirm for the presence of the parasite and then you will be referred to the hospital where you will be treated free of charge with drugs provided by WHO in collaboration with the Federal Ministry of Health.

Risks for participating in this study:

There is little or no risk to you for participating in the study. You will only feel a slight prick and slight pain when your finger is pricked to obtain blood. This will subside thereafter. A secondary infection may occur if the site is exposed to infection.

Will you receive any compensation for participating in this study?

This study is entirely voluntary. You will not receive compensation for participating in this study. However, you will know the results of your blood test. And if you have the disease, you will be immediately referred for treatment.

Benefits of participating in the study:

The benefit of your participating in this study is that you will be able to know whether or not you have sleeping sickness. Also, your participation will provide useful information on how we can tackle the problem. Participation in this study is completely free: you will not

be charged anything for the tests or any other procedure in this study. You will also learn about the results of your test immediately.

How is your privacy going to be protected?

The results of your responses and test will be kept confidential to the extent permitted by law in the country. Your answers to our questions and your test will be identified by using numbers instead of names. However, the Nigerian FELTP/WHO will keep a master list of names to ensure that all affected people receive appropriate medical care from the hospital.

If you have further questions:

If you have further questions, you can contact:

- Dr Uba Belinda - Tel: 08032603446, Email: tanlakas2000@yahoo.com

Thank you very much.

Appendix 4: Proportionate samples from each block in Kachia grazing reserve

Block	Settlements	Population	Total Population	Proportionate Samples from Each Block
1	Wuro Musa Bungel	500	24540	
	Wuro Ardo Bungel	700		
	Wuro Moaduwa	800		
	Wuro Yabaji	470		
	Wuro Macando	200		
	Nassarawa	1600		
	Total	**4270**		**52**
2	Wuro Jam	1000		
	Wuro Nyako	900		
	Wuro Fulbe 1	200		
	Wuro Fulbe 2	1500		
	Tigirpe Dallaji	1000		
	Mayo Jamil	1500		
	Total	**6100**		**75**
3	Mayo Borno	1570		
	Mayo Sale	1500		
	Wuro Kogi	1300		
	Total	**4370**		**53**
4	Tilde Bayaro	1000		
	Mayo Amana	1300		
	Bela Ibrahem	1500		
	Total	**3800**		**47**
5	Wuro Mordi	900		
	Tudun			
	Manuna/Barguma	1300		
	Wuro Bature	1500		
	Total	**3700**		**45**
6	Wuro Giji	1300		
	Tudun Labi	600		
	Wuro Gimi	400		
	Total	**2300**		**28**

Appendix 5: Ethical Approval

Ahmadu Bello University Teaching Hospital

P.M.B. 06, Shika - Zaria, Kaduna State, Nigeria. 069-876305
website: www.abuth.org abuthshika@yahoo.com Abuthshika@gmail.com

Chairman of Board:
Chief Medical Director: DR. LAWAL KHALID, *MBBS, FMCS, FWACS, FRCS(ED) mni*
Chairman, Medical Advisory Committee: DR. ABDULLAHI MOHAMMED, *MBBS, FWACP FICS*
Director of Administration: BARR: ISHAK BELLO, *LL.B, BL, LL.M, PGDM, AHAN, FCAI*

Our Ref: ABUTH/HREC/TRG/36

28th September, 2012

Dr. UBA Belinda Vernyuy
Department of Community Medicine
ABUTH, Zaria

ETHICAL CLEARANCE

Your application for ethical clearance on the research proposal titled **"Prevalence of Human African Trypanosomiasis (HAT)/Sleeping Sickness among Residents of Kachia Grazing Reserve, Kachia Local Government Area, Kaduna State; July 2012.** " refers.

This is to convey ethical approval for you to commence the study. The ABUTH Scientific and Health Research Ethics Committee require an annual update from the Principal investigator.

Prof. Aisha I. Mamman
Asst. Dean PGS
For: Chairman, ABUTH HREC.

MINISTRY OF HEALTH, KADUNA STATE

All Communications to be Addressed to:
THE HON. COMMISSIONER
Quoting Reference and Date
Tel: (062) 248084
(062) 248252

Indepedence Way,
P.M.B. 2014,
Kaduna.
Kaduna State, Nigeria

MOH/HDM/80/VOL.I/95

14/05/2012

Nigerian Field Epidemiology and Laboratory

Training Programme (N-FELTP)

No. 50 Haile Sellasie Street,

Asokoro

Abuja.

RE: SURVEY ON THE PREVALENCE OF HUMAN AFRICAN TRYPANOSOMIASIS IN KACHIA GRAZING RESERVE.

I am directed to refer to your letter Re: HAT/PH/029/1/77 dated 9th May, 2012 requesting for ethical clearance and approval to conduct a survey to determine the prevalence of Human African Trypanosomiasis in Kachia grazing reserve.

After going through your proposal, and ascertained that there is little or no hazard to the study population, you are hereby given the clearance and approval to go ahead with the study.

Please accept the assurance of our highest regards.

Dr Ado Z. Mohammed

Director Primary Health Care

For: Honourable Commissioner.

Plate 1: Administration of Questionnaire to Respondents

Plate 2: Screening of Respondents for HAT