# EPIDEMIOLOGY OF RABIES IN LAFIA NASARAWA STATE, NIGERIA

**BY**

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**ZARIA, NIGERIA**

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**BY**

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**DEPARTMENT OF COMMUNITY MEDICINE,**
**AHMADU BELLO UNIVERSITY,**
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## DECLARATION

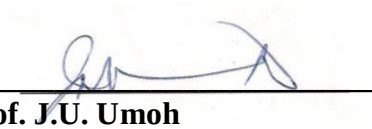
I declare that the work in the dissertation entitled 'epidemiology of rabies in Lafia Nasarawa State, Nigeria' has been performed by me in the Department of Community Medicine under the supervision of Prof. J.U. Umoh. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this dissertation was previously presented for another degree or diploma at any university

**_____** **_____**

**Alabi Olaniran** **Date**

## CERTIFICATION

This dissertation entitled "EPIDEMIOLOGY OF RABIES IN LAFIA NASARAWA STATE, NIGERIA" by Alabi, Olaniran meets the regulations governing the award of the degree Master of Public Health of Ahmadu Bello University, Zaria, and is approved for its contribution to knowledge and literary presentation.



07/09/10

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## DEDICATION

*This work is dedicated to my wife Mrs. Mosunmola Alabi and my lovely daughters Omolade, Tolulope, Biodun and Joke Alabi for their encouragement, patience and understanding in the course of this research project.*

*And in memory of my late father Pa E.A. Alabi and my late brother Prof. S.O. Alabi who laid the solid educational foundation in my life upon which I have endeavor to build upon all these years.*

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## ABSTRACT

In Nigeria rabies is endemic and it is an important public health issue that has remained neglected. This is because of the paucity of data to estimate the true status and the public health impact of the disease. Dogs are the major reservoir of the disease and the route of transmission to humans is mainly via bite from a rabid dog. The consumption of dog meat has now become popular among some communities in Nigeria, but there are no data on the prevalence of rabies virus among the apparently healthy dogs and the level of risk of rabies to the people involved in the handling and processing dog meat in the country. The objective of this study is to estimate prevalence of rabies virus among slaughtered dogs in Lafia and to establish the profile of dog bite victims.

One hundred and fifty (150) heads freshly slaughtered dogs were collected from 5 different locations and tested using FAT. Hospital and veterinary records from 2006-2009 were reviewed to establish the profile of dog bite victims, characteristics of biting dogs and the trend of dog bite. Two hundred questionnaires were also administered to households to estimate dog population. Data collected was analyzed using Epi-info version 3.3 and Microsoft office Excel 2003 to obtain frequencies, percentages and trends.

Dog population of Lafia was estimated to be 33000 with low rabies vaccination coverage. An overall prevalence of 26% among slaughtered dogs was established and dog bites were mainly among male children <15years. The bites were highest in the months of

August and September. Dog bite victims hardly receive the complete post exposure prophylaxis following bite by a dog of unknown rabies vaccination status.

The following recommendations were made, promotion of responsible dog ownership and emphasizing the importance of dog vaccination, promotion of health education on the dangers of rabies and the importance of post exposure prophylaxis and the use of personal protective equipment while handling and processing dog meat. Government should enforce legislation of dog vaccination, registration, movement/confinement of dogs within premises, develop policy to regulate dog slaughter and Dalhatu Araaf Specialist hospital Lafia should keep stock of human anti-rabies vaccine.

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# CHAPTER ONE

# INTRODUCTION

## 1.0 BACKGROUND INFORMATION

Rabies is an acute progressive and highly fatal zoonotic encephalitis caused by infection with the rabies virus. It is characterized by a progressive encephalopathy resulting in disturbance of consciousness, nervous irritability, paralysis, coma and death (Ezebuiro *et al.,* 1980, Rupprecht *et al*., 2002, Kuzmin *et al.,* 2005).

The disease invariably leads to death once clinical signs set in and there have been only three documented cases of humans recovering from rabies after the clinical signs have started (Hattwick *et al*., 1972; Porras, *et al.,* 1976; CDC, 1977). However, there is a recent report of the survival of a 15 years old girl in whom clinical rabies developed one month after she was bitten by a bat in the USA (Willoughby *et al*., 2005). The treatment included the induction of coma, rabies vaccine was not administered. The patient was treated with ketamine, midazolam, ribavirin and amantadine.

Globally, 11 major genotypes have been identified as etiologic agent and rabies virus is the type that is most widespread and epidemiologically the most important member of the genus (Kuzmin *et al.,* 2005). Several specific rabies virus variants have been characterized from different mammalian hosts such as dogs, foxes, mongooses and other carnivores, and bats (Rupprecht *et al*., 2002).

Rabies is estimated to be responsible for at least 55,000 human deaths annually, mainly in the developing countries of Africa and Asia (Meslin *et al.,* 1994; Knobel *et al.,* 2005) and Africa accounts for 24,000 (44%) of these deaths (Knobel, 2005). The human incidences

of rabies are increasing in many countries and burden of rabies falls mostly on poor rural communities and children in particular. Every twenty minutes, a patient most often a child dies from rabies in Africa (Africa Rabies Expert Bureau (AfroREB), 2008).

This is likely to be related in part to the rapid growth rate of dog populations which in many parts of Africa exceeds that of human populations (deBalogh *et al.*, 1993; Cleaveland, 1998; Kitala *et al.,* 2001); there is also the problem of ignorance and poverty. These deaths have, in addition, been attributed to lack of awareness among the population, medical practitioners and health authorities regarding rabies.

The infrastructures for the management of rabies exposure are scarce and there are limited quantities of modern vaccines and lack of immunoglobulins for post exposure treatment (AfroREB, 2008).

Human rabies infections, in most instances, have resulted from exposure to infected dogs, by bites, scratches and mucosal exposures (Warrell *et al*., 1988). The disease is endemic in Nigeria. It has been recognized in man and animals in all parts of the country as early as 1928 (Boulger *et al*., 1960). The degree of endemicity is difficult to ascertain due to lack of adequate records (Nuru, 1973). Dogs serve as the major reservoir (Adeiga, 1998) and principal host species of rabies throughout developing countries (Nel & Rupprecht, 2007).

In Nigeria 99% of persons who contracted the disease got it from dogs (Fagbemi *et al*., 1981). Also, Nawathe *et al*., (1981) reported that rabies in cows, horses, pigs, cats and goats etc is a spill over from dog rabies. There have been evidence that latent rabies exist in the country, apparently healthy dogs were reported to have bitten other dogs, and this

biting dog remained healthy for 6 months whereas the dogs bitten came down with rabies (Anonymous, 1932). Similar findings were reported in Kaduna State, Nigeria (Anonymous, 1935).

## 1.1 STATEMENT OF THE PROBLEM

In Nigeria, rabies is endemic and is an important public health issue that has remained neglected. In most of Africa and specially western and central African countries, notification of rabies is not mandatory, so epidemiological data are scarce (Dodet *et al.*, 2008). This has resulted in inadequate control measures possibly due to under reporting, lack of follow up on victims of rabid dog bite, lack of data on the public health impact of the disease and absence of programs for effective vaccination of dogs and control of stray dogs.

The major route of transmission of rabies to humans is through the bite of a rabid dog, though other unconventional routes have been documented for rabies transmission, especially in the course of handling and processing of dog for meat (Wertheim, *et al.*, 2009). Dog eating is particularly common in states such as Plateau, Akwa-Ibom, Cross River, Ondo, Taraba, Gombe, Kaduna, Adamawa, Abuja, Kebbi and in some parts of Imo, Enugu, Abia and Anambra states (Jalingo, 2008).

Eating of cat meat, is not as common as eating of dog meat, bat consumption has also been reported (Fagbo, 2009). Some communities in Lafia, Nasarawa State, such as the Angas, Mangus and Madas are reported to eat dog meat as food.

There are no records to assist in estimation of the prevalence of rabies virus among apparently healthy dogs and the level of risk of rabies to the people involved in the

handling and processing of dog meat for food in the country. This becomes even more pertinent especially when it is considered that majority of these dogs used for food may not vaccinated be against rabies as revealed by available veterinary records in the state which indicated low vaccination of dogs against rabies.

In the past four years there have been reported increases in the number of confirmed rabies cases in dogs and increases in the number of dog bite victims in Plateau State, Nigeria (Alabi, 2009). Most of the studies on the epidemiology of rabies in Nigeria have been focused mainly on the dog population this is because majority of the reported cases of rabies have occurred in dogs (Durojaiye, 1984). The magnitude of the disease in dogs is an indicator of likely danger to man especially as the disease is greatly underreported (Nuru, 1973).

Since post exposure prophylaxis for humans is expensive and may not be affordable by most communities in developing countries, measures to reduce human risk should be directed at controlling the disease in dogs. It is cheaper and most effective to control rabies through vaccination of dogs. The dog population in Nigeria consists mainly of indigenous breeds with some exotic breeds kept by expatriates and few educated elites (Durojaiye, 1984).

The majority of the local breeds are unlicensed, unvaccinated and they are kept in households and are allowed to roam freely for most parts of the day (Durojaiye, 1984). There are communities within Lafia town that use dog as food and the slaughtered dogs are mainly these indigenous breeds with no history of vaccination thus increasing the risk of exposure of these individuals to rabies in the course of preparing the dog meat. In addition to the problem of reported low vaccination coverage in dogs during this period, there was also reported lack of information on the demographic profile of dog bite

victims, and high cost of human post exposure prophylaxis (Alabi, 2009). There is no indication that the socioeconomic status of these communities can sustain the cost of the recommended routine immunization for dogs and the post exposure prophylaxis for human dog bite victims.

## 1.2 SIGNIFICANCE AND JUSTIFICATION OF STUDY

Lafia is an urban town. It is the capital of Nasarawa state and has an estimated human population of 400,000 (Census 2006). The research will estimate the prevalence of rabies virus among dogs used for food in Lafia, estimate dog population and rabies vaccination coverage in the dog population. In addition it will help to establish the profile of dog bite victims.

The information generated from the study will be useful in developing strategy for the effective control and prevention of rabies in dogs and humans in Lafia, Nasarawa state, Nigeria. In addition make appropriate recommendations to relevant authorities.

## 1.3 GENERAL OBJECTIVE

The general objective is to estimate the prevalence of rabies virus among dogs that are used for food and establish the profile of human dog bite cases and the characteristics of biting dogs in Lafia, Nasarawa State, in order to develop an effective control program.

## 1.4 SPECIFIC OBJECTIVES

**The specific objectives were:**

1. To estimate prevalence of rabies virus in dogs used for food from December, 2009 to April, 2010
2. To estimate dog population and the number of dogs vaccinated against rabies (2006-2009)
3. To estimate the prevalence of dog bite cases and their profile (2006-2009)
4. To assess the availability and the cost of human post exposure rabies vaccines

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 HISTORY

The fear of the disease is universal and legendary. Rabies is described as acute viral encephalitis that affects all warm blooded animals and is one of the oldest diseases known to be transmitted from animals to man, Plutarch asserts that according to Athenodorus it was first observed in mankind in the days of the Ascepiadae the descendants of the god of medicine Aesculapius (Hummeler, 1967).

The Greeks called rabies Lyssa or Lytta which meant madness and the Romans called it "rabere" (to rage). It is from the Roman word that the modern and French name, rabies is derived (Hummeler, 1967).

The people of ancient Greece, Rome and Egypt believed rabies was caused by evil spirits because an ordinarily friendly animal developing the disease suddenly became vicious and aggressive without any apparent cause and, after a period of maniacal behavior, developed paralysis and died (Umoh *et al.*, 1979).

The disease in man was described as hydrophobia in which the victim is tormented at the same time with thirst and fear of water Umoh *et al.*, 1979). This is due to extremely painful spasmodic contractions and paralysis of the muscles of larynx and pharynx which occur when the patient attempts to drink, causing him to spit out the liquid and subsequently avoid drinking water. The spasms result from reflex stimulation or irritation of the swallowing and respiration centers in the brain, such spasms may readily be

induced in the victim by sight of water, an attempt to drink, or even by draught of air (Oboegbulem, 1994).

In Africa, the first major outbreak of rabies in local dogs was recorded in 1884 in Ethiopia (Oboegbulem, 1994). The first case of rabies in an exotic animal was reported in a dog imported from England at Port Elizabeth, South Africa, in 1893 (Rollinson, 1956). In West Africa, the first reported originated in the French speaking zone when a disease of dogs known locally as "Oulon fato" was identified as rabies by Bouffard in 1912. An early existence of the disease in Africa can be inferred from the fact that practically all ethnic language of African peoples has local vernacular names for dog rabies.

In Nigeria, for instance, rabies is variously called "ara nkita" (Igbo), "Ciwon kare" (Hausa), "ginnaji" (Fulani), "digbolugi" (Yoruba), "idat ebua" (Efik/Ibibio) (Oboegbulem, 1994) and the Tivs called it "Iwa Ihunden". Literally translation of these vernacular names indicates that the various language groups recognized rabies as a "mad dog disease".

Traditional Africans had various ethno-medical notions and beliefs regarding the disease. In Nigeria, some traditional concepts on the causes of rabies in dogs include evil spirit, harmattan, juju, charms or native poison, eating of dead human bodies (Oboegbulem, 1994).

The first documented human rabies in Nigeria was in 1912 (Annual report for Southern Nigeria, 1960) in which two cases were reported in Eket and Bonny (Boulger and Hardy, 1960). The first laboratory diagnosis of rabies in Nigeria was made by the rabies laboratory at Yaba in 1925. One of the earliest investigation of dog rabies in this country

was made by Smith in 1928, when he described the clinical signs of five out of six cases of notified during that year.

## 2.2 RABIES VIRUS

The rabies virus belongs to the group of Rhabdoviruses. The virus is enveloped, bullet shaped, lipid containing with single stranded RNA (Hummeler and Koprowski, 1969). The virus is sensitive to lipid solvents, 45-70% ethanol, iodine preparations and quaternary ammonium compounds (Hummeler *et al.*, 1967). It belongs to the genus *Lyssavirus* (Rupprecht *et al*., 2002).

The distribution of rabies virus is virtually world wide. However, few countries and territories are reported to be rabies free such as Islands in the Caribbean, the Pacific and Oceania, and others like Malaysia, Syngapore and the Islands of Taiwan, Guam, Hawaii and Western Samoa which have achieve rabies free status through successful control programs (Acha *et al*., 1983).

Phylogenic analyses have determined the existence of seven genotypes of *Lyssavirus*. Although this number is likely to increase with more intense sampling (Bourhy *et al.,* 1993; Delmas *et al*., 2008; Gould *et al*., 1998; Kuzmin, *et al*., 2005).

Among this biodiversity three genotypes (1, 2 and 3) circulates in Africa, with dogs–adapted viruses belonging to genotype 1 (RABV).

Molecular epidemiological studies of rabies in Africa revealed that four clades of genotype 1 circulate in Africa (Bourhy *et al.,* 2008; David *et al.*, 2007; Kissi *et al.*, 1995). The Africa 1 clade, adapted to dogs, is the most similar to current Eurasian RABV lineage and was therefore grouped into a larger Cosmopolitan clade (Kissi *et al.,* 1995;

Swanepoel *et al.,* 1993), together with a novel clade (Africa 4) identified recently in Egypt (Bourhy *et al*., 2008; David *et al.*, 2007).

In contrast, the Africa 3 clade is restricted to the Republic of South Africa and is adapted to mongoose, so that it constitutes an epidemiological cycle distinct from that of dog RABV (Bourhy *et al*., 2008; Davis *et al*., 2007; Kissi *et al*., 1995; Nel & Rupprecht 2007). Finally, the Africa 2 clade includes RABV strains that circulate in dogs in several central and western African countries. In addition to the classical rabies virus, other related viruses have been isolated in Nigeria. These include the Lagos bat virus isolated from fruit eating bats on Lagos Island (Boulger, 1958), the Mokola virus isolated from viscera of Shrews in Ibadan (Shope *et al*., 1970).

## 2.3 SUSCEPTIBLE HOST

Rabies affects all warm blooded animals. However, they are not equally susceptible (Chalmers & Scott, 1969; Kaplan, 1969; Kaplan & Koprowski, 1980). Birds and opossums are highly resistant. Rodents, lagomorphs, deer and wild dogs have an ecological resistance because of their small size or peculiarities of habit and habitat they are rarely infected (Chalmers, 1969; Winkler *et al*., 1972; Bernard, 1979).

## 2.4 TRANSMISSION

Rabies virus exists in the saliva of rabid animal, and spread through the saliva (Rupprecht, *et al.*, 2002). Exposure occurs when an animal or person comes into physical contact with such saliva or an environment containing live rabies virus (Hattwick and Greg, 1975). The commonest and most important mode of transmission of rabies is direct physical contact in the form of a bite. Exposure due to bite depends on the following epidemiologic factors: the state of the biting animals (whether provoked or unprovoked)

the presence of rabies in the area, and whether the biting animal was shedding the rabies virus at the time of the bite or not.

None-bite exposures such as licks by rabid animals occasionally occurs (Leach & Johnson, 1940). Transmission of person to person is possible since the saliva of infected humans may contain infective virus. This mode of transmission is considered very rare as only few cases have been reported however person to person transmission has been documented through corneal transplants taken from persons dying of an undiagnosed disease of central nervous system (Benenson, 1980).

Airborne or aerosol by inhalation has been documented (Constantine, 1962, Winkler, *et al*., 1973) and demonstrated in caves where bats are roosting (WHO, 1973). Infection has also been reported in people who process dog and cat meat for food (Wertheim, *et al*., 2009). Human cases of rabies from accidental airborne transmission have been reported previously (Fishman, 1968, Bell, 1971, Winkler *et al.*, 1973, Bernard *et al*., 1982 Tariq *et al*., 1991). The mechanism of virus transmission via airborne route and the viral load required for dispersal are not known (Winkler, 1975). It is assumed that environmental conditions for airborne transmission and the virus titre will dictate the effectiveness of transmission (Winkler, 1972). Patients may also get infected through contaminated unrecognized cuts or abrasions of the hands.

Transmission by ingestion has also been demonstrated (WHO, 1973), but it is doubtful if rabies virus can survive for long in the highly acid environment of the stomach. Therefore, oral infection is not considered important in maintaining the disease in nature or in transmitting the virus to animals and man (Schnurrenberger, 1975).

Transmission has also been documented through corneal transplant taken from persons dying of an undiagnosed disease of central nervous system (Benenson, 1980).

## 2.5 INCUBATION PERIOD

In all animals and in man the length of incubation of rabies varies greatly. This variability was thought to depend on the particular type of the host species, the location of entry point of the causative, the amount of virus and the tissue into which it is introduced (Oboegbulem, 1994). In experimentally induced rabies it has been observed that the incubation period varies inversely with the amount of infective virus inoculated and bears no direct relation to the site of the inoculation (Maegraith, 1976).

The short incubation period observed when bites occur on the head, face or hands is believed to be due to more superficial nerve supply of these regions, a larger amount of the virus enters the wounds and get more readily into the nerve tissue than when a bite occurs in the muscle (Oboegbulem, 1994).

Generally the incubation period of rabies varies from 3 – 6 weeks, sometimes as short as 10 days in dogs and in man it could vary from 4-7 weeks or as short as 10 days or as long as over one year depending on a number of factors. These factors include the location or site of bite with regards to richness in nerve supply and closeness to the brain, the severity of the bite wound, the amount of infective dose of virus introduced and whether some form of protection was provided by clothing (Oboegbulem, 1994).

## 2.6 SYMPTOMS OF RABIES

The symptoms of rabies vary in all species of animals and only a proportion of infected animals show all the classical signs and symptoms. However, rabid animals of all species

present a certain clinical picture which is generally considered typical of rabies. There are some variations peculiar to carnivores, farm animals and man.

Clinical manifestations of canine rabies may be divided into three sequential stages or phases: the prodromal, the excitative and the paralytic (Oboegbulem, 1994). This classification of the clinical course of the disease may be no more than academic, since from practical experience, the phases may not be so sequential in many infected dogs. A particular stage may be extremely short or totally absent. Almost as a rule, rabies in dogs manifests clinically in either of two forms: "furious" and "dumb".

The Prodromal phase usually lasts 1-3 days and is marked by changes in behavior which may not be easily distinguishable from any other ailment such as injury, digestive disorder, poisoning, early infectious disease (Oboegbulem, 1994). There is slight rise in temperature although the change in temperature may not be significant. An ordinarily active dog and usually friendly dog may become extremely dull and seek solitude while a shy dog assumes an unduly friendly and playful attitude. The animal tend to stop eating and drinking. A close observation will reveal dilatation of the pupils; the eyes may become glazed. There is irritation or stimulation of the urogenital tract, as may be indicated by frequent urination, sexual stimulation, and erection of the penis in the male animal. The dog assumes an alert, restless and troubled air. It licks or gnaws at the site of the bite because of local irritation (Oboegbulem, 1994).

The excitative (furious) or paralytic (dumb) stage is between the $3^{rd}$ and $5^{th}$ day after the prodromal phase. It represents the classical and more readily recognized "mad dog syndrome".

Early signs include restlessness and an altered appetite, technically referred to as “pica”. This depraved appetite is manifested by chewing and swallowing of sand, pieces of stone, straw, wood and other indigestible objects. There is extreme nervous irritability shown by an alert watchful apprehensive look, change of voice to coarse or hoarse barking sound. The eyes follow moving objects intently with a protrusion of the nictating membrane. The hyperexcitability is further expressed by snapping at invincible objects or at moving objects and by tendency to bite other animals, human beings and any other living or inanimate objects at the slightest or even without provocation (Oboegbulem, 1994).

Rabies dog in confinement will attack and chew the wire and frames of its cage often breaking its teeth. The dog will follow a hand or object moved in front of the cage, with snapping attempts to bite. Tremors or spasms of muscles of the jaw occur followed by paralysis of larynx and pharynx. Usually, but not always, profuse salivation occurs. Later there is muscular in-coordination as evidenced by staggering gait followed quickly by progressive paralysis of hind and fore limbs. Intermittent convulsive seizures may occur. Paresis or paralysis of the respiratory muscles leads to excessive panting, then violent, difficult breathing and the dog finally dies of respiratory failure. Death occurs within 10 days of the onset of the disease (Oboegbulem, 1994).

The furious rabies may progress to the paralytic or dumb form. However, the dumb rabies may occur in the absence of furious phase. The dumb form is characterized by a peculiar starring expression with dilatation of the pupils. The dog shows a tendency to shy away and hide in corners or under chairs. There is early paralysis of the muscles of the throat and masseter muscles. Usually the lower jaw drops, the tongue protrudes, looking dry and brown or leathery and there is profuse drooling of saliva. The dog has difficulty in swallowing. The owner may think the dog has something lodged in the

throat( the bone in the throat syndrome) and he may examine the mouth, searching for and attempting to remove a foreign object with bare hands; the owner is therefore exposed to the risk of infection. This form of rabies is of greater danger to man because the infected dog often times not suspected. The dog is generally not irritable but may still bite (Oboegbulem, 1994).

The paralysis progresses rapidly to other parts of the body and dog dies quietly in a few hours. Reports showed more occurrence of dumb form in Nigeria (Boulger and Hardy, 1960).

The clinical course in human rabies may follow the same prodromal, excitative (furious) and paralytic (dumb) phases as in the dog. The onset is usually sudden and the early signs include malaise, nausea, vomiting, sore throat and abnormal sensation or pain at the site of infecting bite wound. The patient complains of headache and insomnia and shows restlessness and a sense of apprehension. Soon anxiety overcomes him and the restlessness increases to uncontrollable excitement. The patient becomes disoriented, his attention may be momentarily fixed and his speech may come in rushes. There are repeated episodes of extremely painful spasms and contractions of the muscles of larynx and pharynx on attempting to swallow. These spasms may be evoked by mere sight of water or even the thought of drinking. The patient therefore develops fear of water; commonly refer to as “hydrophobia” (Oboegbulem, 1994).

Other patients may exhibit “aerophobia” fear of air (Wilson, 1975) which results from reflex irritability of the respiratory center in the brain. The spasm cause excessive salivation and spitting of viscid fluid. The voice of the patient becomes hoarse and raucous. With more generalized spasms convulsive seizures occur.

Sometimes, human rabies is characterized simply by depression and progressive terminal paralysis without any evidence of excitation of the central nervous system or the excitative stage may be brief. Rabies in humans is invariably fatal once the clinical signs have started. To date there have been only three fully documented cases of recovery of patients after the clinical signs have appeared (Hattwick *et al*., 1972, Porras *et al*., 1976, CDC, 1977).

## 2.7 HUMAN RABIES

Rabies in humans has been reported in various parts of Nigeria. An annual deaths from rabies was average 9.0 per 100000 population between 1973 and 1974 in Eastern Nigeria (Ezeokoli, 1977), while between 1962-1974 average annual deaths for Nigeria was 17.67 per 100000 population (Umoh, 1979). The national 10 years survey conducted by Ezebuiro *et al*., 1980 revealed a mortality of 16.9 per annum in 37% of the Nigeria population.

However, of the 341 reported cases of human rabies in 1990, 27 deaths were recorded while 11 deaths occurred from the 1055 cases in 1991 (Coker *et al*., 2000). The World Animal Health Information Database interface ranked rabies as the first zoonoses in Nigeria in 2008 with 3 lethal cases about 0.0023 rates for 100,000 Population (OIE-WAHID, 2009). These data are grossly underestimated due to poor reporting systems in most developing countries of the world.

## 2.8 PATTERNS OF DOG BITES AND DOG BITE SITUATION IN NIGERIA

The human incidences of rabies are increasing in many countries. This is likely to be related in part to the rapid growth rate of dog populations, which in many parts of Africa

exceeds that of human populations (Chomel *et al.,* 1992; deBalogh, *et al.,* 1993; Kitala *et al.,* 2001). It is an important public health issue that has remained neglected and inadequately controlled possibly due to the lack of political commitment, under reporting, lack of follow up on victims of rabid dog bite, lack of data on the public health impact of dog bite and rabies disease and absence of programs for the control of stray dogs.

In Nigeria, there is absent of reliable data on the demography of bite victims, this may be due to the lack of awareness of the hazard of dog bite, importance of timely visits to clinic for post-exposure prophylaxis and poor reporting (Alabi, 2009).

Most of the reported human cases of rabies in Nigeria were from dog bites, 50 of the 120 cases notified between 1928 and 1959 had antecedent of dog bite (Boulger *et al*., 1960).

All the ten human cases seen at the Lagos University Teaching hospital between 1962 and 1972 and the seven cases seen at University College Hospital between 1962 and 1973 were attributed to dog bite. Between 1987 and 1995, 67 human deaths from rabies were reported and these were linked to dog bite (Federal office of statistics 1993; Federal Ministry of Health, 1996).

In Plateau state, between years 2006 and 2008 there were reported increases in the number of laboratory confirmed rabies cases in dogs and the number of dog bite victims (Alabi, 2009). During this period there was reported problem of low vaccination coverage in dogs and lack of adequate information on the demographic profile of dog bite victims, administration of incomplete dose of human post exposure vaccination (Alabi, 2009).

## 2.9 CONSUMPTION OF DOG MEAT AS FOOD

Eating of dog meat is very popular in Asian countries and some African countries namely; Angola, Cameroon, Congo and Nigeria. In Nigeria, consumption of dog meat has become popular among most communities and this cut across socio-cultural boundaries (Eze *et al*., 2002).

The states that are known for eating dog meat in Nigeria include Plateau, Akwa Ibom, Cross Rivers, Ondo, Taraba, Gombe, Kaduna, Adamawa, Abuja, Kebbi, and some parts of Imo, Enugu, Abia and Anambra states (Jalingo, 2008). The angas, mangus and mada communities in Lafia Nasarawa state are reported to eat dog meat.

Live dog markets where dogs are sold as food animals exist in Nigeria. However, there are also retail outlets even now dogs can be bought, slaughtered and consumed at private houses, most times sold publicly as barbequed or boiled in soup (pepper soup).

## 2.10 RABIES IN SLAUGHTERED DOGS

In Nigeria the consumption dog meat cuts across geographical and socio-cultural boundaries (Eze *et al*., 2002). There are limited data on the prevalence of rabies antigen among the slaughtered dogs that eaten. In a survey for rabies infection and among apparently healthy and unvaccinated dogs slaughtered for human consumption in Maiduguri, rabies antigen was detected from 16 (31%) of the 52 dog heads collected from slaughter sites (Ajayi, *et al*., 2006).

## 2.11 CONTROL AND PREVENTION OF RABIES

The effective prevention of clinical rabies in animals and man is achieved by immunization. Despite the availability of effective vaccines for dogs, which are considered as the main reservoir host in most of the developing world and the principal

source of infection for humans, rabies remains uncontrolled throughout Africa and Asia (WHO, 2001; Cleaveland, 1998). WHO recommends that 70% of dogs in a population should be immunized to eliminate or prevent rabies outbreak (WHO, 2001).

The basic principles of control of animal rabies as recommended by WHO (1982, 1984) include; elimination of stray dogs, canine vaccination and wildlife control. In Nigeria, attempts to control rabies have been directed towards controlling the disease in dogs and cats (Fagbemi *et al*., 1981), by stray dog control and by vaccination of dogs with modified live virus chick embryo origin low egg passage (LEP) flury strain vaccine produced by the National Veterinary Research Institute Vom (Umoh and Belino, 1979).

## 2.12 LABORATORY DIAGNOSIS OF RABIES

### 2.12.1 Fluorescent antibody test (FAT)

The fluorescent antibody staining technique is the widely accepted and WHO recommended diagnostic tool capable of detecting rabies virus particle or antigens in infected brain tissues and or in impression smears conjugated with fluorescein isothiocyanate. It is based on detection of rabies virus antigen by direct visual observation of specific antigen-antibody reaction under ultraviolet microscope; the complexes appear as brightly colored, green or greenish yellow objects against a dark background (Markson, 1969).

The FAT and virus isolation in culture are the “gold” standard methods for rabies diagnosis from a fresh material. However, once the brain sample start to decompose the sensitivity of FAT is reduced (Kamolvarin *et al*., 1993; Heaton *et al*., 1997).

The fluorescent antibody staining technique is a sensitive diagnostic tool capable of detecting viable as well as non-viable (inactivated) rabies virus particle or antigens in both sectioned infected brain tissues and in impression smears.

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 STUDY AREA

The study was conducted in Lafia the capital of Nasarawa state. Lafia lies between Latitude 8.53573 decimal degrees north of the equator and 8.52995 decimal degrees east of the Greenwich. The natural vegetation of the area is predominantly Guinea savanna. It is bounded to the North by Kaduna state, to the East by Plateau and Taraba states and to the South by Kogi and Benue states (Figure 1). The state is made up of 13 local government areas (Figure 2).The greater parts of the inhabitants are agrarians, hunters and mostly rural based. The major tribes are Eggon, Kambari, Hausa, Alago others include Mada, Angasawa and Mangu. Christianity and Islam are the forms of religion practiced in the town although non-believers also exist in the town.

The population of Lafia town is about 400,000 persons (2006 Population Census). The selected dog slaughtering locations were at Akruba (Angas), Agwan Mangu, Tudun Amba, Tudun Gwandara and Sixteen Mangoro.

### 3.1.1 HEALTH INFRASTRUCTURES

Dalhatu Araf Specialist hospital was chosen for this study because it is the only secondary health facility in Lafia that could handle cases of dog bite. About 10 private hospitals were also identified in the town.

### 3.1.2 VETERINARY INFRASTRUCTURES

The state veterinary service is headed by the Director of veterinary services in the Ministry of Agriculture. The state has six functional veterinary clinics that are located at Lafia, Obi, Doma, Akwanga, Keffi and Nasarawa local government areas. However, only one functional veterinary clinic is located in Lafia.

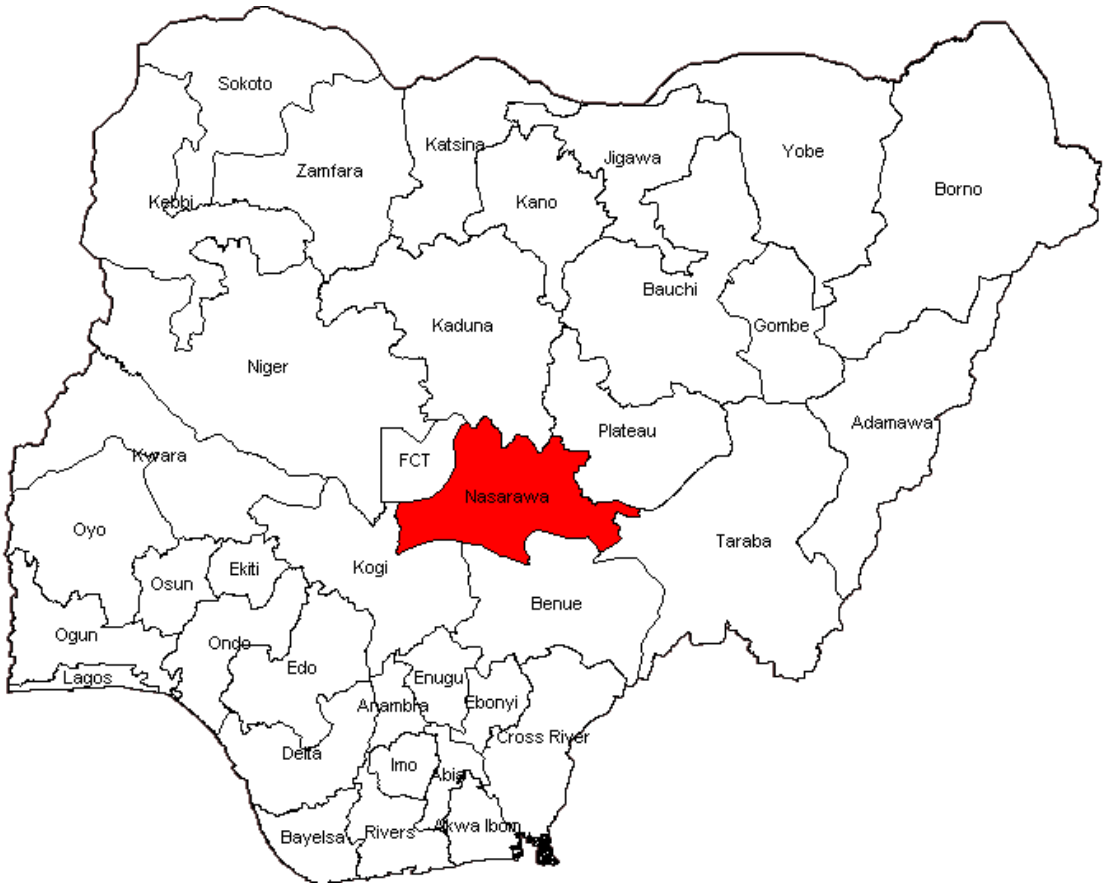



**Figure 1: Map of states in Nigeria and Nasarawa State highlighted**




**Figure 2: Map of Nasarawa States showing the Local Government areas and Lafia Highlighted**

## 3.2 Study design was descriptive cross-sectional

## 3.3 Sample size

The calculation of the number of dog heads to be collected was based on an expected prevalence of 23% (Okoh, 1986) from this, the estimated a sample size of one hundred and forty six (146) including 5% non response.

However, a total of one hundred and fifty (150) dog brain or fresh dog head specimen from all the five identified slaughter locations. See sample size calculations below;

Expected rabies prevalence 23%

Sample size= $\frac{Z^2Pq}{d^2}$

Precision (d) 7% (Okoh, 1986)

Z = 1.96

Sample size = $\frac{1.96^2*0.23*0.77}{0.07^2}$

= 139 add 5% non response

### 3.3.1 Dog head collection

The collection of dog heads started from December, 2009 to April, 2010. A total of 5 slaughter locations were identified in Lafia, dog heads were collected from all the 5 identified locations. An average of 1 to 2 dogs is slaughtered per day. The number of dog heads collected at each location was based on the average number of dog slaughtered per day. We did a proportionate allocation of the number of dog heads to be collected per slaughter site (Appendix IX). We then collected every consecutive dog head slaughtered during the 5 months period until the number estimated for the location was reached.

### 3.3.2 Transportation of dog head specimen to the laboratory

These specimens were packed in Coleman boxes with ice packs and transported to the rabies laboratory at National Veterinary Research Institute, Vom within 24 hours. The analysis of specimens and confirmation was done at the laboratory, using fluorescent antibody test (FAT).

### 3.3.4 Treatment of dog head specimen collected for laboratory diagnosis.

The fresh well preserved head is held firmly by clamping with a vice, the skin is reflected with a sterile knife and scalpel blade. The skull is cut open with a manual hack saw to

expose the brain. The brain is then placed in a tray, and then cut open from the dorsum to expose the hippocampus. The hippocampus is removed. Using an applicator stick, a portion is cut and drops on a clean and sterile filter paper. This is then emulsifying into an aliquot on the filter paper.

Using a grease free slide, two smears were made per slide by pressing the slide on the emulsify hippocampus and allowed to dry in air and then placed in a coupling jar.

The slide was fixed by covering it with acetone in the jar. This was placed in the freezer ($-15^{o}C$) to ($-20^{o}C$) and held for 1-2hrs.

After fixing, the slides were removed from acetone and air dried. The slides were then placed against glass rods in an enclosed in a humid chamber. They were stained with the conjugate, and the conjugate was spread uniformly on the slide using an applicator stick. The preparation was incubated at $37^{o}C$ for 30 minutes after which the slides were washed by dipping in phosphate buffered solution (PBS) $P^{H}$ 7.4 in a coupling jar and further rinsed for 2 successive ten minutes period. The slides were then removed and air dried in vertical position.

A drop of buffered glycerol 7.6 $P^{H}$ was added to the slide and cover slip placed over the smear area and then examined under the fluorescent microscope (Plate II).

### 3.3.5 Interpretation of result

When properly stained a positive smear containing rabies antigen shows as brilliantly fluorescent apple-green or greenish-yellow structures (Plate III), varying in size from tiny bodies which are commonly called sand or dust and are barely visible to those comparable in size to negri bodies.

Control slides are examined before and after scanning the test smear to ensure that the equipment was operating satisfactorily and that the smears are properly stained. Control slides were examined after every tenth test slide.

## 3.4 HOUSEHOLD QUESTIONNAIRES

Household questionnaires (Appendix XI) were used to estimate dog population, the number of dogs per household as well as determination of the number of dogs vaccinated per household, educational level of heads of households, reasons for keeping dogs etc. The households were selected from the different quarters in Lafia. Interviewers were recruited and trained on how to administer the questionnaire. The interviewer completed the questionnaires for the illiterate households while the literate household completed their questionnaires. A total of 200 questionnaires were administered. The content of the questionnaire focused on educational status of head of household, occupation of head of household, number of person per household, number of dogs per household, dog ownership, reason for owning and owning a dog, dog feeding system, dog housing system, dog confined or not confined etc.

### 3.4.1 Administration of Questionnaires

The estimation of the number of questionnaires to be administered was done just as the sample size calculation here we added another 50 questionnaires to account for no response, to add up to 200.

### 3.4.2 Sampling Technique

We used the systematic random sampling technique. Twenty quarters (settlements) were identified in Lafia town (Appendix X). From this we selected four quarters randomly for the survey. Each quarter was allocated 50 questionnaires.

In each of the selected quarters we counted 200 house holds and divided by fifty to get our sampling interval (K) which was 4. The first house hold to be administered the questionnaire was selected randomly from 1 to 4, subsequently every $4^{th}$ house hold was administered a questionnaire until we obtained fifty households.

## 3.5 HUMAN DOG BITE

Letter of introduction was collected from the FELTP Program Director and ethical clearance from A.B.U scientific committee and delivered to the Chief Medical Director, Dalhatu Araf Specialist Hospital, Lafia to allow access to the archived dog bite records in the Specialist Hospital in Lafia. Four years record from January 2006 – December, 2009 were reviewed for demographic profile of dog bite victims, the site of bite, treatment given to dog bite victims, the cost and availability of post exposure prophylaxis (Human antirabies vaccine). The Hospital is the only secondary health facility in Lafia and functions both as a general (secondary) and tertiary health facility.

## 3.6 DATA COLLECTION

### 3.6.1 Estimating prevalence of rabies among the slaughtered dogs

The total number of dog head specimen collected and the number of the dog head specimen that was positive for rabies from the laboratory results were recorded.

### 3.6.2 Estimating dog population and the total number of dogs vaccinated in Lafia

Household data from questionnaire surveys which included occupation of head of household, level of education, number of persons in household, number of dog per household, dog vaccination status, management system (housing and feeding system) . Veterinary records were also reviewed to characterize the biting dogs in terms of vaccination against rabies.

### 3.6.3 Estimating human dog bite cases and their profile

Data on the number of human dog bite cases from January 2006- December 2009, gender, age, site of bite, post exposure treatment and prophylaxis received were extracted from hospital and veterinary records.

### 3.6.4 Assessment of availability of post exposure prophylaxis and the cost

Information collected included the availability of post exposure human anti rabies vaccines in the market and the cost of receiving post exposure prophylaxis (PEP).

## 3.7 DATA ANALYSIS

Data collected was analyzed using statistical soft ware such as Epi-info version 3.3 and Microsoft office Excel 2003 to obtain frequencies, percentages and trends. The result of the analysis was used to estimate prevalence of rabies in dogs slaughtered, dog population, number of dogs vaccinated, determine the profile of dog bite victims, vaccination status of biting dogs and monthly number of dog bites.

### 3.8 ETHICAL CLEARANCE

Ethical clearance obtained from the scientific committee, Ahmadu Bello University, Zaria. Informed consent of respondents was obtained before the administration of questionnaires.

## CHAPTER FOUR

## RESULTS

A total of one hundred and fifty (150) freshly slaughtered dog heads was collected from five different slaughter locations in Lafia during a five months period and were examined for rabies virus using Fluorescent Antibody Technique. An overall rabies prevalence of 26% was recorded.

Table 4.1 shows the prevalence of rabies virus antigen among the dog head specimens collected from different locations in Lafia. Twenty two dog head specimens were collected from Tudun Gwandara, 10(45.5%) were positive for rabies particle. Twenty two dog head specimens were collected from Tudun Amba, 10(45.5%) were positive for rabies particle. In Angwan Mangu of the 22 dog heads collected, 8(36.4%) were positive for rabies. In Akruba out of the 42 dog head collected only 11(26.2%) were positive for

rabies. The entire 42 dog head specimen collected from Sixteen Mangoro were negative for rabies particle.

**Table 4.1: Prevalence of rabies antigen in heads of dogs in different dog slaughter Locations using FAT**

| Slaughter location | Number of dog head | Breed | Rabies vaccination status | Number positive by FAT |
|---|---|---|---|---|
| Tudun Gwandara | 22 | Local | Unknown | 10 (45.5%) |
| Tudun Amba | 22 | Local | Unknown | 10 (45.5%) |
| Angwan Mangu | 22 | Local | Unknown | 8 (36.4%) |
| Akruba Angas | 42 | Local | Unknown | 11 (26.2%) |
| Sixteen mangoro | 42 | Local | Unknown | 0 (0) |
| **Total:** | **150** | | | **39 (26%)** |

## 4.1 HOUSEHOLD DOG POPULATION SURVEY AND THE ESTIMATION OF DOGS VACCINATED AGAINST RABIES IN LAFIA

The household data from questionnaire surveys was also used to estimate the dog population, person/dog ratio, educational level of heads of households, reasons for keeping dogs etc. A total of two hundred (200) questionnaires were administered to different households. A total of 1409 persons and a total of 116 dogs lived in these households. About 60% of the heads of the households had secondary and tertiary education. The head of these households were mainly civil servants (50%) and business men (42%). The majority of the dogs kept were local breeds (87.8%) mainly as guards (88%). They were not housed (70%) and only 21.6% of these dogs were vaccinated against rabies (Table 4.3).

## 4.2 PROFILE OF REPORTED DOG BITE VICTIMS IN LAFIA 2006-2009

Of the total 36 human dogs bite victims that reported at the medical facility between 2006 and 2009, males comprised 25 of the victims (69.4%) and whereas the females were 11 (30.6%). Children in the age group 0-14 years represented the victims in over half (52.8%) of the cases and were most at risk of been bitten by dog (Table 4.2). The gender and age group variables were significantly associated with the occurrence of dog bites.

Among the 36 dog bite victims that were recorded in the medical facility during this period, no victim had been bitten a second time, no hospitalization and no reported death following a bite incident. The bites were mainly on the legs (61%) of victims (Table 4.2).

**Table 4.2: Age, Gender and Site of bite of reported dog bite cases in Lafia 2006-2009**

| Variable | Group | Number of victims (N=36) | Percentage (%) |
|---|---|---|---|
| **Sex**: | Male | 25 | 69.4 |
| | Female | 11 | 30.6 |
| **Site of bite**: | Fore arms | 14 | 38.9 |
| | Legs | 22 | 61.1 |

| | | | |
|---|---|---|---|
| **Age (years)**: | | | |
| | < 15 | 19 | 52.8 |
| | 15-29 | 10 | 27.8 |
| | 30-49 | 5 | 13.9 |
| | >50 | 2 | 5.5 |

**Mean Age of dog bite victims = 18.5**

**Standard deviation= 14.4**

**Table 4.3 Findings of Household Survey**

| | | |
|---|---|---|
| **Total Number of household** | 200 | |
| **Education level of head of household**: | **Frequency** | **(%)** |
| Nil | 30 | (15%) |
| Primary | 48 | (24%) |
| Secondary | 70 | (35%) |
| Tertiary | 52 | (26%) |
| **Occupation of head of household**: | | |
| Civil servant | 98 | (49%) |
| Business | 84 | (42%) |
| Farmer | 18 | (9%) |
| **Reason for keeping dogs**: | | |
| Guard | 178 | (89%) |
| Hunting | 12 | (6%) |
| Pet | 8 | (4%) |
| Gift | 2 | (1%) |

| | | |
|---|---|---|
| Total number of people | 1409 | |
| Total number of dogs | 116 | |
| Number of dogs/household | 0.58 | |
| Human/dog ratio | 12/1 | |
| Total number vaccinated | 26 | (22%) |
| **Vaccination status of dogs**: | | |
| | Yes | 26 (22%) |
| | No | 90 (78%) |
| **Dog housed**: | Yes | 35 (30%) |
| | No | 81 (70%) |
| **Breed of Dog**: | Alsatian | 8 (7%) |
| | Cross | 6 (5%) |
| | Local | 102 (88%) |

---

### 4.3 MONTHLY DISTRIBUTION OF DOG BITE IN LAFIA 2006-2009

The studies reported that incidents of dog bite peaked in the months of August and September (Figure 4.1) and fairly consistent number of bites was reported during the last three months of the year (Table 4.4).

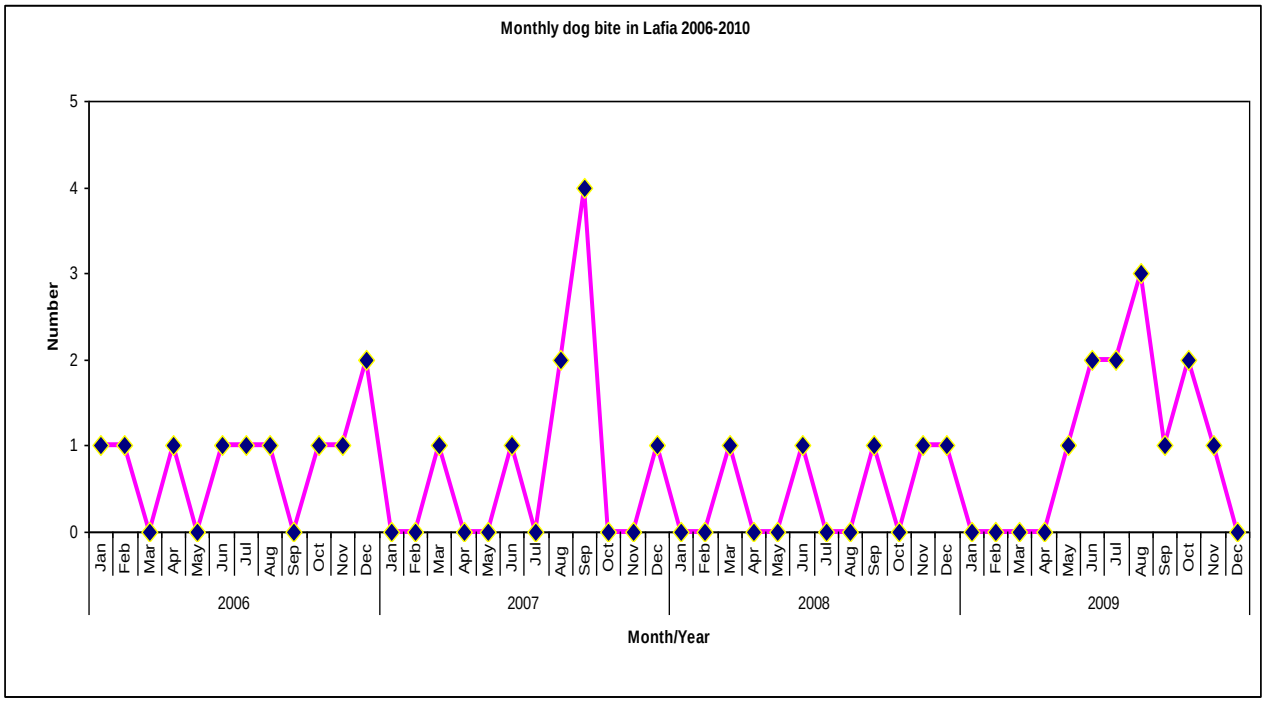



**Figure 4.1: Monthly distribution of dog bite in Lafia 2006-2009**

**Table 4.4: Monthly and Cumulative number of dog bite in Lafia 2006-2009**

| Month | Number of bites | Cumulative number of bites |
|---|---|---|
| January | 1 | 1 |
| February | 1 | 2 |

| | | |
|---|---|---|
| March | 2 | 4 |
| April | 1 | 5 |
| May | 1 | 6 |
| June | 5 | 11 |
| July | 3 | 14 |
| August | 6 | 20 |
| September | 6 | 26 |
| October | 3 | 29 |
| November | 3 | 32 |
| December | 4 | 36 |

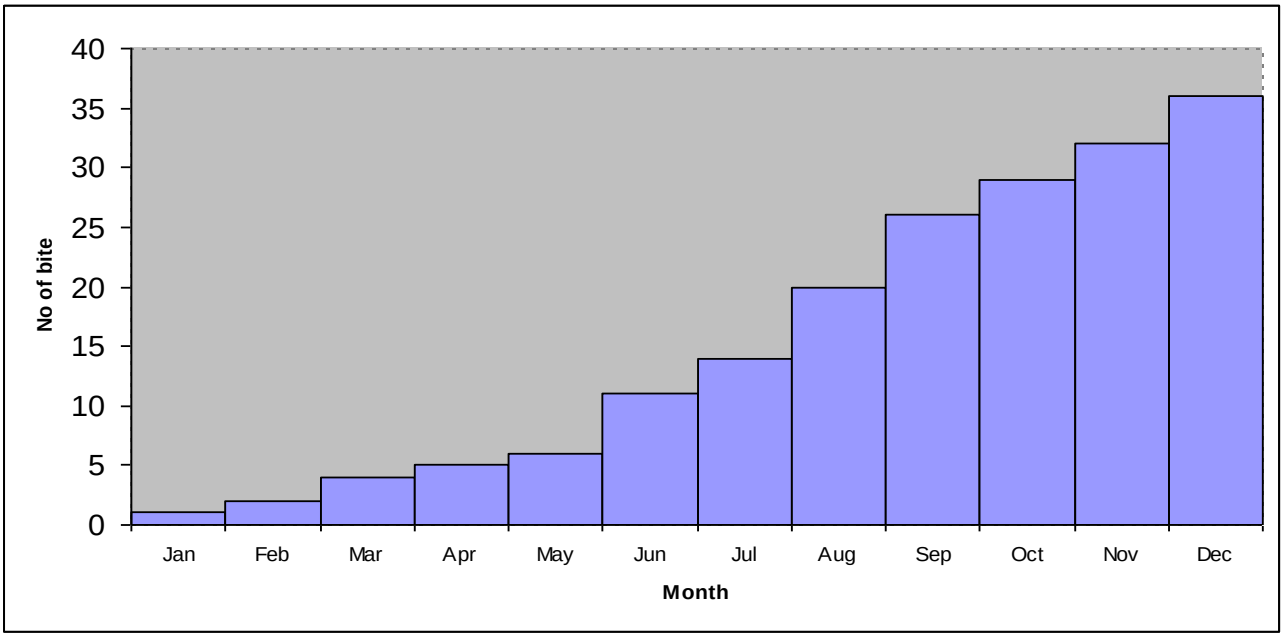



**Figure 4.2: Cumulative monthly distribution of dog bite in Lafia 2006-2009**

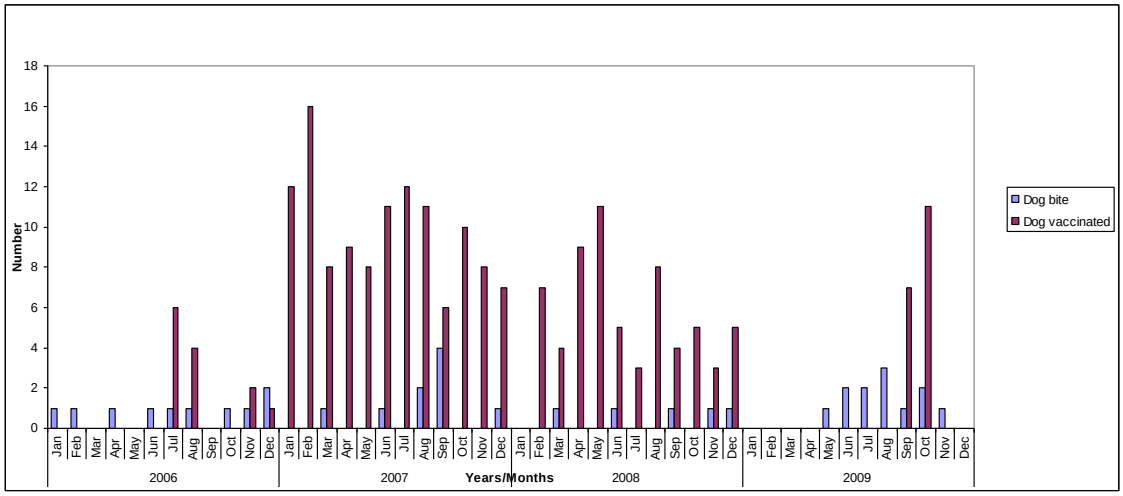



**Figure 4.3: Monthly distribution of dog bite and dog rabies vaccination in Lafia 2006-2009**

## 4.4 Characteristics of the biting dogs from 2006-2009

Of the thirty six (36) biting dogs, 78% (28) were owned while 22% were stray dogs. Thirty two (89%) of these dogs were not vaccinated or were of unknown vaccination status (Table 4.5).

**Table 4.5: Characteristics of the biting dogs in Lafia from 2006-2009**

| Characteristics | Number | Percentage (%) |
|---|---|---|
| Owned | 28 | 77.8 |
| Stray | 8 | 22.2 |
| Vaccinated | 4 | 11.1 |
| Not Vaccinated/Unknown vaccination-status | 32 | 88.9 |

## 4.5 POST EXPOSURE MANAGEMENT AND PROPHYLAXIS OF BITE VICTIMS FROM 2006-2009

Of the 36 dog bite victims that reported to the hospital, only 19 (53%) of them had their bite wound washed with soap and antiseptics. Those that received tetanus toxoid, antibiotics and analgesics were only 19 (53%). Those that did not receive any of the above treatment were 17 (47%).

Out of the 36 bite victims only, 7 (19%) received the complete (5 doses) of post exposure prophylaxis, 1 (3%) received one dose, while 28 (78%) had no record of receiving the post exposure prophylaxis (Table 4.6).

**Table 4.6: Post exposure management and prophylaxis of bite victims in Lafia from 2006-2009**

| Treatment | Number (N=91) | Percentage (%) |
|---|---|---|
| 1. Wound washes with soap &Antiseptic | 19 | 52.8 |
| 2. TT*/Antibiotics/Analgesics | 19 | 52.8 |
| 3. No record for treatment 1&2 above | 17 | 47.2 |
| 4. 5 doses of PEP** (complete) | 7 | 19.4 |
| 5. 1 dose of PEP** | 1 | 2.8 |
| 6. No record of receiving PEP** | 28 | 77.8 |

*TT -Tetanus toxoid

**PEP -Post exposure prophylaxis

## 4.6 ASSESSMENT OF AVAILABILITY OF POST EXPOSURE PROPHYLAXIS AND THE COST

There has never been a stock human post exposure rabies vaccine in the government specialist hospital. The vaccine is only available in one outlet, a private pharmacy in Lafia. The source of the vaccine is Lagos. Availability is, however not assured throughout

the year round. The cost per ampoule is N2,500 the total cost of receiving the complete 5 doses is N12,500.

## 4.7 Limitations

1. Incomplete records on dog vaccination and dog bite victims
2. No documentation on the outcome of dog bite victims

# CHAPTER FIVE

# DISCUSSION

**Prevalence of rabies in different dog slaughter locations using FAT**

In this study, we reported that one quarter of the dogs used for food in Lafia had rabies virus. These finding presents serious public health implications because of the unknown vaccination status of these dogs. In addition, the crude methods used during the

processing of this dog meat for food exposes the handlers to risk of rabies especially through unrecognized broken skin and even through inhalation of viral particles (Plate IV- VI). These community members are continuously exposed to risk of rabies as they source their dogs that have no vaccination history against rabies from outside the state. The sourced dogs are always brought home before they are slaughtered and if they are carrying the rabies virus it may pose serious danger of rabies to the community and the people at home due to close contacts during the processing. There are reports that in some instances when there is a case of human dog bite the dog eaters are invited to come and kill the biting dogs which they use as meat. Because of their level of ignorance, they do not bother to submit these dog heads for rabies diagnosis, as such dogs that may be rabid are handled and processed for food using bare hands (Plate IV-VI). In Asia the rising deaths related to rabies through eating of dog meat are as a result of weak management by health authorities and lack of public awareness about the threat of rabies.

In china cases of human rabies have been linked to handling, processing and consumption of dog and cat meat for food (Wertheim, 2009). In Viet-Nam dog butchering is considered a risk factor for rabies transmission (Wertheim, 2009).

Recent human rabies deaths resulting from consumption of dog meat appears to have influenced the Vietnamese government to withdraw proposed draft standards for preparing dog meat for human consumption and to reiterate the ban on eating cats and dogs.

**Household dog population survey and the estimation of dogs vaccinated against rabies in Lafia**

From the household questionnaire survey we estimated dog population in Lafia to be about 33000 (1dog:12persons) and only 22% of these were vaccinated. The study also revealed that the dogs that are used for food were mostly the local breeds that have no history of vaccination against rabies and the veterinary records revealed a low vaccination figures. All these have significant public health implications in terms of risk of rabies and should be of concern. It underscores the importance of responsible dog ownership with grave consequences to the public and therefore means that the bite from any dog should be considered a rabies risk. The vaccination levels falls far below the reported level of 70% that has been shown to halt rabies transmission (Beran, 1991). The situation highlights the social impact of rabies prevention programs and the need for community education that should address the importance of responsible dog ownership. 70% of these dogs are not housed and seems unlikely because of the economic constraints that the restriction of dog movement will be an enforceable method for reducing dog to dog contacts and rabies transmission in the near future.

We also reported that these communities keep dogs mainly as guards (89%) and the dog to person ratio was 1: 12 which is in contrast to the work of Brooks (1990) who reported a 1: 4.5 and 1: 16 for rural and urban areas in Zimbabwe respectively however Raustenbach *et al*., (1991) found a ratio of 1:11 for a rural town in Botphuthatswana.

**Profile of reported dog bite victims in Lafia 2006-2009**

It is important to note that this study only focused on the epidemiology of medical attended dog bites and that the real incidence would therefore be underestimated (Beck *et al*., 1985; Guy *et al*., 2001). The findings of very low dog bite cases support a previous observation that far less than 50% of dog bite were reported to medical or legal authorities (Overall and Love, 2001). The actual incident of dog bites could still be

greater than reported in this survey. This is probably because the veterinary record of the number of human dog bite cases in Lafia during the period was greater than the number in the hospital records and sometimes the bite victims hardly report to the hospitals for PEP. The number of bite was highest among children in the age group 0-14 years this represented 52% of the cases, while 69% were males. Similar demographic pattern has been reported (Beck *et al*., 1985; Thompson, 1997; Ozanne-Smith, *et al*., 2001; Feldman *et al*., 2004; Ostanello *et al*., 2005; Schalamon *et al*., 2006; Leo'n, 2006). Children's limited experience or skills in recognizing a dog's body language and in perceiving hazardous situations might trigger the occurrence of biting incidents (Mathews, 1994; Lakestani *et al*., 2005).

The extreme curiosity showed by children aged 5-9, together with a marked decrease in adult supervision, may largely explain the high incidence in this group (Love, 2001). This is in contrast to some other studies that have focused on veterinary or behavioral practices (rather than on records of medical attendance for dog bites) and found adults to be the most common victims (Guy *et al*., 2001; APBC, 2005). The latter might support the idea that more dog bites among children result in medical attention in comparison with adults, either by the severity and location of the wounds or by a possible parental sense of responsibility (Guy *et al*., 2001).

The males tended to have higher cases of bite. It has been suggested that boys are socialized to engage in more risk-taking behaviors and learn to play more roughly than girls (Mathews, 1994). Independently of the nature of these trends, the existence of demographic patterns in dog bites (males and children) point towards an important role of human factors in the likelihood of being bitten by a dog (Mathews, 1994; Love, 2001; Kahn *et al*., 2003). These bites were mostly on the legs, most bites results when the child

is running away from the dogs and the legs are the lowest easily available spot for the dog to bite. This however contrast to what was reported in other studies (Guy, *et al.,* 2001; Benson *et al*., 2006).

**Monthly distribution of dog bite in Lafia 2006-2009**

The results showed peak incidents of dog bites in the months of August and September. This period coincides with the dog breeding season and dogs tend to congregate during this period in search of females for mating. Previous studies have also shown more incidents during the warm seasons, especially during summer months, coinciding with holiday period (Chomel *et al*., 1992; Borud *et al*., 2000; Schalamon *et al*., 2006). It is suggested that during this time people and dogs spend more time together and children are less supervised by parents thus increasing the risk for incidents. These findings may assist in the timing and planning of control programs by targeting this period.

**Characteristics of the biting dogs from 2006-2009**

Our findings showed that 77.8% of the biting dogs were owned and only 11.1% of these dogs were vaccinated against rabies. This underscores the importance of responsible dog ownership with grave consequences to public health.

**Post exposure management and prophylaxis of bite victims from 2006-2009**

This survey shows that not all dog bite victims are adequately informed of the appropriate first aid local wound treatment following dog bite, thus increasing the risk of rabies. The World Health Organization emphasizes the importance of prompt local treatment of all

bite wounds and scratches that might be contaminated by rabies virus. The recommended first aid procedures include immediate and thorough flushing and washing the wound for a minimum of 15 minutes with soap and flowing water, detergent, iodine and other antiseptics of proven lethal effect on rabies virus (WHO, 2005).

Only slightly above half of the 36 dog bite patients had the WHO recommended first aid treatment following the dog bite. Standards for rabies post-exposure prophylaxis have been clearly defined by the World Health Organization (WHO) Expert Committee on Rabies (WHO, 2005).

This study also revealed that only 7 patients (19.4%) with dog bite incidents had the complete PEP (5doses) though most of the biting dogs were of doubtful vaccination records against rabies and this may increase the risk of rabies among the bite victims that the did not take the complete PEP. This should be a cause for concern to the public health more so that there are no records of what was the outcome of these patients. It is possible that some of these bites may have resulted in severe consequences that are not documented in the hospitals.

The most commonly encountered causes of PEP management failures are

1. Rabies immunoglobulin not being used at all, being injected only intramuscularly and not into wounds, or not all bite wounds have been injected.
2. Vaccine or rabies immunoglobulin (RIG) being of low potency
3. An exceptionally large viral load being introduced.
4. The virus being an atypical strain that is not neutralized by the RIG or by natural antibodies resulting from vaccination.

5. Inadequate wound care.

**Assessment of availability of post exposure prophylaxis and the cost**

This study also revealed that the government specialist hospital never had a stock the human antirabies vaccine. This is not encouraging and calls for concern considering the public health importance of the disease. If the government has stock of vaccines the prices can be subsidized and also one is sure of maintenance of cold chain in handling vaccines. The cost estimate in this study was conservative as several cost items were not taken into consideration.

# CHAPTER SIX

# CONCLUSION AND RECOMMENDATIONS

## 6.0 CONCLUSION

The prevalence of rabies among dogs slaughtered for food was 26%. The cases of dog bites were mostly among male children from 0-14years. Dog bite victims hardly receive the complete post exposure prophylaxis following bite by a dog of unknown rabies vaccination status. The only secondary health facility that handles cases of dog bites in Lafia does not stock human anti-rabies vaccines for post exposure prophylaxis and the vaccine is only available in one private pharmacy. The price of complete post exposure

prophylaxis is expensive this may not be affordable to the majority of the community members.

Although this study did not report any human rabies among the dog bite victims, none the less the result obtained from this research should be of great concern for urgent intervention by policy makers, health professionals and veterinarians.

## 6.1 RECOMMENDATIONS

**To Veterinarians, Health professionals and dog owners/dog handlers**:

1. There should be promotion of responsible dog ownership and emphasizing the importance of dog vaccination.
2. There should be promotion of health education on the dangers of rabies and the importance of post exposure prophylaxis
3. The people that handle dog and process dog meat for food should be educated on the importance of the use of personal protective equipment while handling and processing dog meat

**To Government**:

4. There should be enforcement of legislation for dog vaccination, registration, movement/confinement of dogs within premises and also a policy to regulate slaughter of dogs

5. The Dalhatu Araaf Specialist hospital should be encourage to keep stock of human anti-rabies vaccine

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## APPENDICES

## APPENDIX I



**Plate I: Slaughtering of dog at Tudun Amba**

## APPENDIX II



**Plate II: Showing a fluorescent microscope**

## APPENDIX III

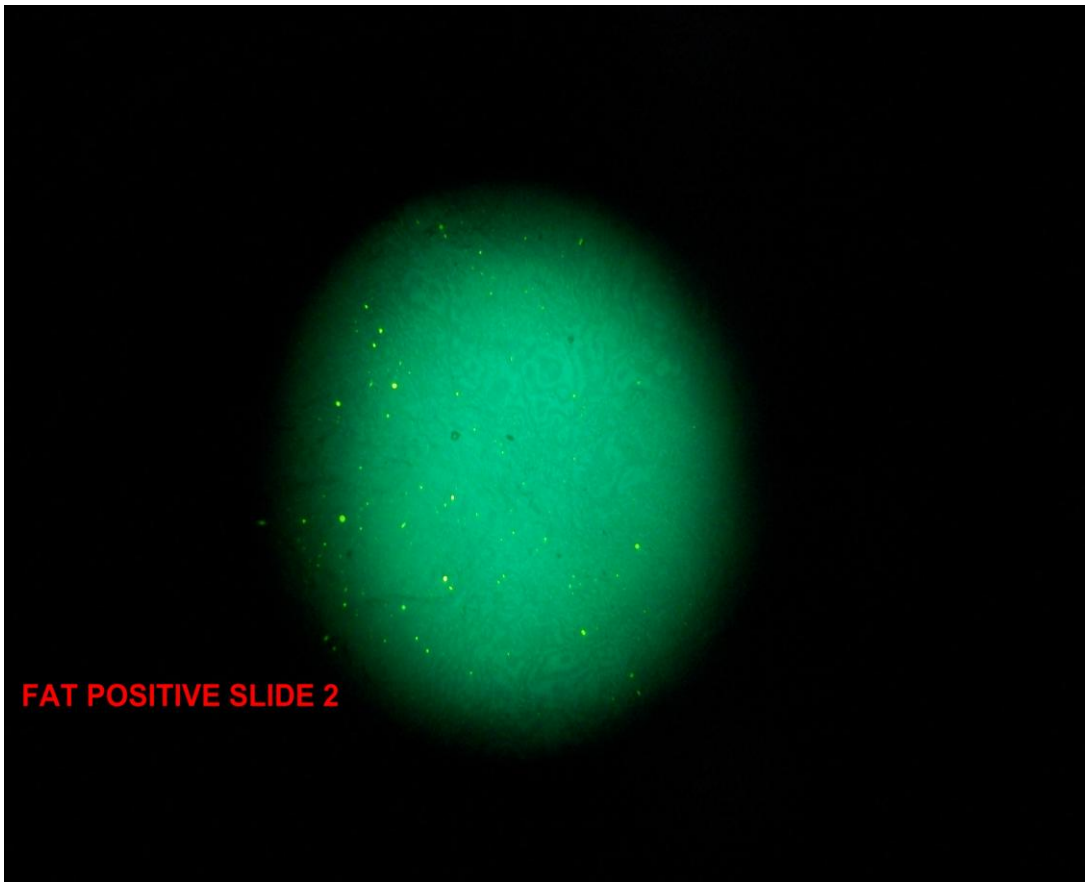



**Plate III: FAT Positive Slide with brilliantly fluorescent apple green particles.**

## APPENDIX IV




**Plate IV: Butchering and processing the dog head for food**

## APPENDIX V



**Plate V: Butchering and processing the dog head for food**

## APPENDIX VI



**Plate VI: Butchering and processing the dog head for food**

**APPENDIX VII**

## Work Plan

**Work plan from November, 2009 – Aug, 2010.**

| S/N | ACTIVITY | Nov | Dec | Jan | Feb | Mar | Apr | May | JUN | Jul | Aug |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Identification of all the dog markets | ■ | | | | | | | | | |
| 2 | Dog head specimen collection | ■ | ■ | ■ | | | | | | | |
| 3 | Laboratory diagnosis | | | ■ | ■ | ■ | | | | | |
| 4 | Data entry/analysis | | | | | ■ | ■ | ■ | | | |
| 5 | Final Report Preparation | | | | | | | ■ | ■ | ■ | |
| 6 | Submission of report | | | | | | | | | | ■ |

## APPENDIX VIII

**Budget and Cost estimate:**

| S/N | Cost item | Details | Unit cost(N) | Total cost(N) | Total cost ($) |
|---|---|---|---|---|---|
| 1 | Rabies Pre-exposure prophylaxis | 4 person | 12500 | 50000 | 335 |
| 2 | Dog head | 100 | 700 | 70000 | 469 |
| 3 | Conjugate for FAT test | 3 no. | 70000 | 210000 | 1400 |
| 4 | Cost of cold boxes and ice packs | 4 no. | 5000 | 20000 | 134 |
| 5 | Cost of labor for veterinary technicians | 4 no. persons | 20,000 | 80000 | 534 |
| 6 | Office supplies | | Lump | 10000 | 67 |
| 7 | Travels | 2 no. persons for 30 days | 100000 | 200000 | 1334 |
| 8 | Miscellaneous | Lump | Lump | 50000 | 335 |
| | Total | | | 700000 | ($) 4675 |

## APPENDIX IX

**Estimating the sample size per slaughter location**

| Slaughter location | No of dogs slaughter/week | Duration of collection(weeks) | Weighted average | Dog head per site |
|---|---|---|---|---|
| Tudun Gwandara | 7 | 20 | 7x20 | 140x150 =22<br>980 |
| Tudun Amba | 7 | 20 | 7x20 | 140x150 =22<br>980 |
| Angwa Mangu | 7 | 20 | 7x20 | 140x150 =22<br>980 |
| Akruba Angas | 14 | 20 | 14x20 | 280x150 =42<br>980 |
| Sixteen Mangoro | 14 | 20 | 14x20 | 280x150 =42<br>980 |
| | | | 980 | 150 |

## APPENDIX X

**List of Settlements in Lafia**

1. Akruba
2. Bukarsidi
3. Tudun Amba
4. Tudun Gwandara
5. Sixteen Mangoro
6. Akasa
7. Ambana
8. Mararaba
9. Tudun Kauri
10. Andere
11. Gandu
12. Bukar Kwato
13. Ombi 1
14. Angwan Mangu
15. Bukar Allu
16. Bakin rijiya
17. Adoju
18. Mararaban Tudun Wada
19. Sabon Gari
20. Wakwa

## APPENDIX XI

**DOG POPULATION STUDIES IN LAFIA, NASARAWA STATE**

I am a resident under the Nigerian Field Epidemiology and Laboratory Training Program, Federal Ministry of Health. I am conducting a study to estimate dog population and the prevalence of rabies in dogs in Lafia, Nasarawa State. The findings of this study will help in formulating policies for the control of rabies in dogs. Please note that all information given will be treated with utmost confidentiality. Thank you for your cooperation.

**A. Identifying information.** **Date: _____**

Name of head of household (Optional):_____

Occupation of the head of household: _____

Educational status: Nil □ Primary□ Secondary □ Tertiary□

Number of person in the household: _____

Address: _____

LGA: _____

Tel No: _____

**B. Management information:**

Do you own a dog? Yes/No. If yes, how many dogs in the household_____

Reason for owning a dog: □As guard for security □As pets □Hunting □Gift □All of the above □Don't know

If no above, why_____

Feeding system: □Table food (scrap) □ Special pet food □They feed themselves □ Don't know

Dog housed: □Yes □No

Confined: □Yes □No

**C. Dog history and demographic Information:**

Breed_____ Age_____ Sex_____

Vaccinated against rabies: Yes/ No. If yes, date_____

If not vaccinated, why?_____