# DOG ECOLOGY AND THE EPIDEMIOLOGICAL STUDIES OF CANINE RABIES IN LOKOJA, KOGI STATE, NIGERIA

BY

STEPHEN SHEHU OKEME. DVM (ABU)

DEPARTMENT OF VETERINARY PUBLIC HEALTH AND PREVENTIVE MEDICINE, FACULTY OF VETERINARY MEDICINE, AHMADU BELLO UNIVERSITY ZARIA, NIGERIA.

JANUARY 2016

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A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY ZARIA, NIGERIA. IN PARTIAL FULFILMENT FOR THE AWARD OF THE DEGREE OF MASTERS OF SCIENCE IN VETERINARY PUBLIC HEALTH AND PREVENTIVE MEDICINE

DEPARTMENT OF VETERINARY PUBLIC HEALTH AND PREVENTIVE MEDICINE, FACULTY OF VETERINARY MEDICINE, AHMADU BELLO UNIVERSITY ZARIA, NIGERIA.

JANUARY 2016

## DECLARATION

I declare that the work in this Dissertation entitled 'Dog Ecology and the Epidemiological Studies of Canine Rabies in Lokoja, Kogi State, Nigeria' has been performed by me in the Department of Veterinary Public Health and Preventive Medicine under the supervision of Dr. G.S.N.Kia and Professor 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 thesis was previously presented for another degree or diploma at this or any University.

OKEME Stephen Shehu

Name of Student _____ Signature _____ Date

## CERTIFICATION

This Dissertation entitled "DOG ECOLOGY AND THE EPIDEMIOLOGICAL STUDIES OF CANINE RABIES IN LOKOJA, KOGI STATE, NIGERIA by OKEME Stephen Shehu meets the regulation governing the award of the degree of Master of Science of the Ahmadu Bello University Zaria and is approved for its contribution to knowledge and literary presentation.

Dr. G.S.N. Kia _____

_____

Chairman Supervisory Committee Signature Date

Professor J.U. Umoh _____

_____

Member, Supervisory committee Signature Date

Professor E.C. Okolocha _____

_____

The head, Signature Date
Department of Veterinary Public Health
And Preventive Medicine,
Ahmadu Bello University, Zaria.

Professor S.Z, Abubakar _____

_____

Dean, School of Postgraduate Studies Signature Date
Ahmadu Bello University Zaria.

## DEDICATION

This Dissertation is dedicated to the Almighty God who gave me the inspiration to start and finish this work.

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## ABSTRACT

Rabies is a viral zoonotic disease which affects both humans and animals. It is worldwide in distribution and its control remains a public health challenge. There is paucity of information on the epidemiology and public health significance of canine rabies in Lokoja, hence the need for a study of canine rabies and its public health implications in the city and environs. A descriptive and cross sectional study was set up to investigate dog ecology, examine factors/circumstances associated with dog bites and vaccination of dogs and also to assess knowledge, attitude and practices of residents of Lokoja. The study also investigated the presence of rabies antigen in the brain tissues of dogs slaughtered for human consumption in Lokoja. The dog ecological studies revealed that 778 dogs were counted in the direct street count. There were 444 (57.0%) male dogs and females were 334 (43%), the male female ratio was 1.33:1. While in the compound survey a total of 295 dogs were counted, males accounted for 180 while the females were 115, and are in a ratio of 1.6:1. Information was obtained from the State Veterinary Clinic and a Private Veterinary Clinic, all in Lokoja on dog bite cases and victims involved and dog vaccination records covering a period of 11 years (2003-2013). Out of 95 human dog bite cases, 46(48.4%) were in persons between 10-19 years of age, of which 57(60%) were males and 38(40%) were females. Anatomical location of bites indicated higher frequency on the legs (48%) than other parts of the body. Male dogs had a higher frequency of anti-rabies vaccination (57%)

compared to females (43%) The highest rate of vaccination in dogs was within the ages of 3-12 months in both the Government clinic and the private Veterinary Clinic. There is an adequate knowledge about rabies among the residents of Lokoja, out of 400 respondents, 310(77.5%) knew the source of rabies in Nigeria, 273(68.3%) were aware that it was unlawful not to vaccinate dogs against rabies, 279(69.8%) indicated that vaccination of dogs should be repeated yearly, 321(80.3%) knew that keeping dogs that were not vaccinated against rabies was dangerous to human health. Majority of the respondents 311(77.8%) disagreed that children should be allowed to play with dogs. The age group 20-30 years had highest acceptable knowledge (76.7%) scores while the age >40 had the highest practice scores of 84(94.4%). Also, civil servants had the highest practice scores of 140 (92.7%) than other occupational categories. Respondents with secondary and tertiary education had significantly higher acceptable attitude (88.9%) and practice (50.4%) scores towards rabies than respondents with non-formal and primary education ($p>0.05$). Rabies antigen was detected in 11(5.28%) out of 208 brain samples examined by fluorescent antibody technique. The findings in this study indicate that frequent dog bites, insufficient vaccination coverage, and presence of rabies antigen in dogs slaughtered for human consumption were suggestive of high public health risk of rabies to residents of Lokoja, Kogi state and thus requires strategic intervention.

## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

**Figure** **Page**

## APPENDIX

# CHAPTER ONE

## 1.0 INTRODUCTION

### 1.1 Background Information

Rabies is an acute contagious and highly fatal disease of all warm blooded animals caused by the rabies virus. Rabies is one of the most feared of all diseases because of its terrifying symptoms which almost invariably ends with death. Rabies remains incurable and survivors are extremely rare (Alvarez *et al.,* 1996).

The rabies virus is of the genus lyssavirus which encompasses other similar viruses. Rabies virus travels to the brain by following the peripheral nerves. The incubation period of the disease depends on how far the virus must travel to reach the central nervous system, usually taking a few months, (Haig 1976; Moran *et al*, 2008). In man like all other viral diseases it begins with fever, headache and muscle aches, sore throat fatigue and nausea. The characteristic symptoms that strongly suggest rabies is a tingling sensation at the site of virus entry, usually an animal bite. These early symptoms begins one to several months after virus entry and progresses rapidly to symptoms of encephalitis, agitation, confusion, hallucinations, seizures and increased sensitivity to light sound and touch (Haig 1976; Moran *et al* 2008). Although all species of mammals are susceptible to rabies infection only a few species are important as reservoirs for the disease (Garba *et al.,* 2009). The domestic dog is the main reservoir for rabies virus in Nigeria (Oboegbulem 1994, 2010; WHO, 2010). It is reported that 99% of rabies victims contracted the disease from dogs (Fagbemi *et al.,* 1980) and it is a common knowledge among the populace that rabies results from dog bites. The saliva of a rabid dog has been documented to contain the rabies virus and serves as a medium for transmission of infection (Bishop *et al*., 2002; CDC, 2007).

Collection of dog population data and study of dog ecology is a key component for dog population management and control. Knowledge of dog abundance is a prerequisite for planning of animal control and vaccination campaigns. Data such as dog ownership, relationship to human society, population density, age, dominant sex, habitat and relationship to other species should be collected for programme planning. Dog population size, distribution and accessibility are also essential data for programme planning, as well as attitude of people and society toward dogs. Endemic canine rabies, a high dog population density, large numbers of unvaccinated dogs that are not properly cared for and assessment of people seeking medical advice after being bitten by animal, public education about strategies to avoid animal bites and minimising contact with wild animals are the main factors that contribute to the increase in the number of cases of human rabies (Matibag *et* al., 2007).

Vaccination against rabies virus is a highly effective method of preventing rabies in humans and animals (Jakel *et al.*, 2008). Dog rabies control relies principally on the mass vaccination of dogs in order to achieve herd immunity levels sufficient to inhibit rabies transmission (Perry and Wandeler, 1993), and also provides the most cost-effective and efficient strategy for controlling canine rabies (Clifton, 2007). Free roaming and unvaccinated dog population may increase the likelihood of spread of rabies virus (RABV).

Dog bites constitutes the primary mode of rabies transmission to humans which allows the passage of virus-containing saliva across the broken skin (Fearneyhough, 2001). Dogs are the main reservoir hosts of rabies and source of infection to humans. The control of rabies is also hampered by cultural, social and economic realities (Enervon *et al.,* 2004).

The Direct Fluorescent Antibody (DFA) test is the gold standard for rabies diagnosis (CDC, 2011). This is based on detection of rabies virus antigen by visual observation of specific antigen-antibody reaction. This technique operates on the principle that anti-rabies IgG labelled with fluorescein isothiocyanate reacts with specific antigen in the brain smear and the product is viewed under ultra violet light as described by Dean *et al.* (1996). Apple green fluorescence indicates the presence of rabies. Detection of rabies antigen indicates presence of the virus which is a significant factor in transmission of rabies from dogs to humans.

The occurrence of a disease in a population is influenced by some determinants or risk factors which may either represent the host, environment or agent (Pfeiffer, 2002; Martin *et al.,* 1987).These determinants can affect the frequency, distribution or dynamics of the disease in a population. Risk factors such as age, gender, breed, season and location had been reported to play a significant role in the epidemiology of rabies (Widdowson *et al.*, 2002; Owai, 2009).

## 1.2 Statement of Research Problem

Dog ecology is defined as the distribution, structure and population density of dogs. This can be obtained by street counts and human household or compound questionnaire survey. Well-designed dog ecology and demographic studies are necessary (Perry, 1993). Such studies have proved useful in planning rabies control in Asia, Latin America, and in the North, East, and Southern Africa (WHO 1984, WHO 1990). Reports on studies relating to dog ecology in Nigeria is available for Kaduna (Ezeokoli *et* al., 1987), Lagos (Ogboegbulem & Nwakonobi 1989), Jos (Okoh, 1986), Lagos (Hambolo *et al.,* 2014), Maiduguri (El-Yuguda *et al.,* 2007), Makurdi (Omudu *et al*., 2010), Bauchi (Atuman *et al* 2014) and Ilorin (Aiyedun and Olugasa *et al.,* 2012a).

Although rabies is a vaccine-preventable disease, it still poses a significant public health problem in many countries in Asia and Africa where 95% of human deaths occur even though safe effective vaccines for both human and veterinary use exist (WHO, 2010). Developing countries including Nigeria are considered risk areas for rabies exposure. The vaccination status of the suspected animal alone should not be used when considering whether to initiate post-exposure prophylaxis or not (CDC, 1983; WHO, 2008; 2010), as human deaths have resulted even from bites of dogs reported to have been adequately immunized against rabies. The Centre for Disease Control and Prevention (1983), has reported confirmed deaths of two persons after being exposed to rabies from a dog bite in Nigeria before travelling to the United States (CDC, 1983) and another died in Belgium from rabies acquired from a dog bite received in Africa. Blyth (2007), also showed that there are cases where pets have developed rabies in compounds or homes where missionaries live in Nigeria Blyth (2007). Reliable data are scarce in many parts of the developing world making it difficult to access the full impact of rabies in humans and animal health (WHO, 2006). Rabies remains a serious public health hazard in many developing countries where dog bite continues to be the main mode of transmission of the disease to humans (Widdowson *et al*, 2002). There are also reports of rabies virus carrying and excreting healthy dogs (Oboegbulem 1994, Ajayi *et al*, 2006).

### 1.3 Justification of the Study

In the past the erstwhile Nigerian Minister of Health, Professor Onyebuchi Chukwu said an estimated 10,000 people, mostly children, are exposed to rabies from dog bites each year but detection and diagnosis fail to pick up actual number of cases Daily Independent Newspaper Nov. 2013, insisting the burden of the disease was unknown,

he said cases were often “under-diagnosed and under-reported due to lack of diagnostic facilities and trained personnel. “Passive surveillance used in case detection has been grossly inadequate” (Daily Independent Newspaper Nov. 2013). Fagbemi *et al*., (1981), recorded 169 cases of human rabies in 38 hospitals in five epidemiological units in Nigeria over a 10 year period (1969 -1978). Rabies infection in both humans and dogs are under-reported and the status of canine rabies is still unknown (WHO, 2006).

Dog ecology studies can generate information that public health workers and veterinarians can use to plan vaccination campaigns, to reduce the risk of rabies in domestic animals and humans (Flores-Ibara and Estrella -Venezuela, 2004).

Understanding the epidemiology of rabies in dog population is crucial in planning the control of the disease (Widdowson *et al.,* 2002). Dogs are the most widely spread and abundant of all carnivores (Wandeler *et al.,* 1993). It is therefore important to study the role of dogs in human cultures and the impact of their interactions (Wendeler *et al*., 1993)

There have been reports of canine rabies outbreak in two dogs in Lokoja and an outbreak in a dog in Okene Local Government Area. These cases were however not confirmed as the dogs were killed and buried before the veterinary authorities could get there. (Anon. 2014)

Diagnosis of human rabies in hospitals is mostly based on expression of specific symptoms by patients who are exposed to rabid dogs as there are no diagnostic tests carried out, thus making the disease to be misdiagnosed.

Socio-economic factors such as incomes, employment status, means of transportation and awareness of rabies are associated with owners of non – vaccinated dogs (Awoyomi *et al* 2007). These factors which might be present in Lokoja may result in

the low level of anti- rabies vaccination. According to Adeyemi *et al.,*(2005), and Ogunkoya *et al*., (2010), this low anti-rabies vaccination tendency builds up susceptible dog populations and favours large-scale epizootic or focal outbreaks with an increase in rabies risk to veterinarians, para-veterinarians, dog owners and their family members as well as the general public.

From personal observation at the State Veterinary Clinic Lokoja dog bite cases do occur, hence the need for a study on canine rabies and its associated public health implications in the area.

The information on canine rabies status will serve as an epidemiological tool and a basis for intervention strategy towards the disease in Lokoja. According to Widdowson *et al.* (2002), controlling rabies in urban dog populations is seen as a more cost-effective, long term approach to prevent human rabies than reliance on post-exposure human treatment. Knowledge of risk factors for canine rabies in urban settings is needed to assess the danger to public health. There has been no proper assessment of knowledge, attitude and practice as it relates to rabies among the residents of Lokoja. WHO (1998) stated that information on public knowledge, attitude and practice with respect to dog ownership and rabies control can be used to create a comprehensive picture for planning rabies control programmes. Lack of public education campaigns and risk communication are also some of the factors affecting and making eradication of rabies very difficult (Clifton, 2007).)

Studies on rabies in apparently healthy dogs have been carried out in different parts of the country (Ameh Ajayi *et al.,* 2006. Garba *et al.,* 2008, Sabo 2009, Akombo 2009, Aliyu 2010, Isek 2013, Ogbonna 2014, Hambolu 2014, Odeh 2014.). However, information of this nature on rabies in Kogi State is lacking and has not yet been reported despite rabies outbreak in neighbouring states (Akombo 2009) There still

exists an eclipse of information on rabies epidemiology in Kogi State. There is therefore a need to find out the status of rabies in the state, especially carrier status. Therefore, the study of dog ecology in Lokoja, the assessment of vaccination of dogs, the frequency of dog bites, knowledge, attitude and practice (KAP) of the residents of Lokoja to rabies, detection of rabies antigen in dogs slaughtered in Lokoja all tied together will be useful in elucidating the epidemiology of rabies, and hence enhance effective preventive and control strategy against rabies transmission in the study area.

## 1.4 Aim and Objectives of the Study

### 1.4.1 Aim of the Study

The aim of this study is to determine the status of rabies endemicity in dogs in Lokoja, Nigeria.

### 1.4.2 Objectives of the Study

The objectives of this study are:

1. To determine the distribution, structure and population density of dogs and the pattern of dog ownership (dog ecology) in Lokoja, Nigeria.
2. To determine the distribution of vaccinated dogs by age, sex and breed in Lokoja from 2003 – 2013
3. To determine association between age, sex, seasonal variation and human dog bite cases in Lokoja from veterinary clinic records.
4. To assess the knowledge, attitude and care seeking preferences of residents towards rabies prevention in the study area.
5. To detect the presence of rabies antigen in the brain tissues of dogs slaughtered for human consumption in Lokoja, Nigeria.

## 1.5 Research Questions

i. What is the dog distribution structure, population density and pattern of dog ownership in Lokoja, Nigeria?

ii. What is the vaccination status of dogs against rabies and pattern of dog bite cases in Lokoja, Nigeria?

iii. What are the factors associated with dog bites in Lokoja, Nigeria?

iv. What is the level of knowledge, attitude and practice of dog owners to rabies in Lokoja, Nigeria

v. What is the prevalence of rabies antigen among slaughtered dogs in Lokoja, Nigeria?

# CHAPTER TWO

## 2.0 LITERATURE REVIEW

### 2.1 Dog Ecology

Dog population studies are important pre-requisites in planning for an effective rabies control programme. The population size, ecology, and proportion of ownerless dogs in a community, as well as accessibility of dogs to vaccination campaigns and public attitude towards rabies control programmes and measures are valuable information for planning and evaluation of anti-rabies campaign (WHO, 2002). The cross-sectional study method that combines direct street count with the administration of questionnaire or door-to-door interview of urban and rural residents is the traditional technique for dog population studies in African countries (Olugasa *et al.,* 2012). Dog ecology studies, dog population density, dog population structure as well as the pattern of dog ownership (Cleaveland *et al*., 2006). In Africa as well as other developing countries the domestic dog is the most important reservoir and vector of human rabies (WHO, 1992). The rate of disease transmission will therefore depend on the density of the dog population and social behaviour that determines the extent of contact (Maheriosa, 2007). Dog population studies are needed in various parts of Nigeria to aid regular, adequate and sustainable programme for canine rabies control in the country as observed across African countries (Kitala *et al.,* 2001; Knobel *et al.,* 2008; Ratsitorahina *et al.,* 2009; Olugasa *et al.,* 2011).

### 2.2 Rabies Vaccination

As BBC News headlined worldwide on September 8, 2007, the first World Rabies Day, rabies could be wiped out across the world if sufficient vaccinations are carried out on domestic dogs. The possibility of eradicating canine and some other rabies strains

through targeted mass immunization has been under discussion among public health veterinarians and animal advocates for at least as long as the notion of eradicating smallpox has been discussed (Merritt, 2011) The original rabies vaccine developed by Louis Pasteur and Emile Roux was created by harvesting the virus from a dead infected rabbit. The virus was then put out to dry for 5 to 10 days, weakening it significantly. The weakened virus was then injected into the patient, effectively infecting him with a mild form of the virus. This allowed the human to build up immunity to the virus, with a small risk of succumbing to the vaccine. Other countries still use a form of tissue-derived vaccines because they are a great deal cheaper than modern vaccines.

Low and high egg passage (LEP, HEP) flurry rabies vaccine for dog and cat respectively, have been produced in Nigeria by the National Veterinary Research Institute, Vom, since 1956 (Nawathe *et al.,* 1989) and are the common prophylaxis for animal rabies control in Nigeria. Initial vaccination of dogs is at 3 months of age, immunity last 3 years but an annual booster vaccination is recommended in Nigeria because of the enzootic nature of rabies in most areas

Despite evidence that control of dog rabies through programmes of animal vaccination and elimination of stray dogs can reduce the incidence of human rabies, exposure to rabid dogs is still the cause of over 90% of human exposures to rabies and of over 99% of human deaths worldwide (CDC 2007). Despite the availability of safe, relatively cheap and effective vaccines for dogs, rabies remains uncontrolled throughout most of Africa and Asia (Cleaveland, 1998; King, 1999; WHO, 2001). To qualify as epidemiologically worthwhile, a vaccine delivery strategy needs to be effective in both coverage and cost. Theoretical and empirical analyses indicate that vaccination of 70% of dogs should be sufficient to prevent epidemics and eliminate endemic rabies infection (Coleman and Dye, 1996), but this level of coverage is rarely achieved in dog

vaccination programmes in Africa (Perry *et al.*, 1995; Kitala *et al.*, 2002). The first co-ordinated National anti-rabies campaign held in Nigeria was in 1982, during the two weeks campaign only 44,627 dogs representing 1.5 % of the countries dog population then were vaccinated (Obuegbulem, 1994). Progress toward eliminating canine rabies has been contrastingly rapid in nations that have emphasized preventively vaccinating dogs, even if the vaccination drives have not been followed up with systematic revaccination and vaccination of additions to the dog population ( Merrit Clifton, 2011). For example, "In a mass vaccination campaign conducted in Peru in March 1985, 270,000 dogs (65% of the estimated dog population) were vaccinated over the course of one month with an inactivated tissue culture vaccine. Since that time, no human rabies cases have been reported. In addition, the number of animal rabies cases has declined to only three from a previous mean of 292 cases per year since 1980," (Clifton, 2011)**.**

### 2.3 Dog Bites.

With the close association of dogs and humans in daily life, dog attacks with injuries from very minor to significant (severe to fatal) – are extremely common, (CDC 2007). Dog bite is the wound sustained from the teeth of dogs. It is of great public health concern as most cases of human deaths from rabies have been almost always attributed to dog bites (CDC, 2008; Debra, 2009). The saliva of dogs which is the major medium of rabies infection have been documented to contain high concentration of rabies virus (Beran, 1981).

Dogs are kept by many families as a pet and for security in the house. However, due to the economic down turn in the country, many of the families do not take care of these dogs, or even vaccinate them (Adeleke, 2009). Rabies remains a significant public health problem in many countries, causing approximately 50,000 to 100,000 human deaths per year worldwide, almost exclusively in Asia and Africa (WHO, 2006). More

than 99.9% of human deaths reported worldwide result from the bite of a rabid dog, and 30-50% of them concern children less than 15 years of age (WHO, 2006). Rabies is maintained in nature by several domestic and wild animals, including dogs, foxes, mongooses, raccoons, skunks, and many bat species. Although the main route of transmission is through the bites of rabid dogs, the epidemiology of the disease varies from one region or country to another and therefore all animal bites warrant medical evaluation (CDC, 2011; WHO, 2008). In children, the rate of dog bite–related injuries is highest for those ages 5 to 9 years, and children are more likely than adults to receive medical attention for dog bites. Male adults are more likely than female adults to be bitten. (CDC, 2003). Bata *et al*., (2011) reported that most of the victims of dog bites are children less than 20 years of age, most of them (66%) bitten by their neighbours dogs. Most of the cases were seen between September and April during the dry periods in Jos Plateau State. The most common sites of bite were on the legs, buttocks and the thigh while the least affected site were the upper arm and the face ( Adeleke, 2009). Majority (92.7%) of the dogs involved in a bite could be traced to a particular owner by the bite victims.

Post-exposure anti-rabies vaccine in combination with human rabies immune globulin administered soon after bite by suspected rabid dogs have been found to be very effective in controlling human rabies. The recommended post-exposure prophylaxis is intramuscular administration of human diploid cell vaccine into the deltoid on days 0, 3, 7, 14, and 28. Injections can be given into anterolateral thigh for children. (WHO 2016, CDC 2016**)**

### 2.3.1 Consequences of dog bites

The pattern of rabies in Nigeria still implicates dogs as the principal vector of the disease (Tomori, 1980). Dogs are listed as only moderately susceptible but are without

any doubt the animals most likely to spread infection to human beings, while squirrels and other rodents are also susceptible ((Nadin-Davis *et al.,* 2000). In Nigeria, particularly in some areas in Kaduna metropolis, a survey of the apparently healthy dogs showed positive results of the rabies virus (Ogbonna, 2014) and in other studies carried out in the North-western states of Nigeria, positive results for rabies were also revealed (Garba, 2007). In the USA, Canada, and Western Europe, where canine rabies has been controlled, dogs are responsible for very few cases. Rather, human rabies develops from bites of wild animals (especially bats, squirrels, rats, raccoons, skunks and foxes) or occurs in travellers bitten by dogs elsewhere in the world (Smith, 1995).

Between 1980 to 1998, rabies was reported in eleven children in Sokoto, Nigeria (6 males, 5 females, aged 3 to 13 years old) all of whom had history of dog bites but in only 2 cases was post exposure anti-rabies vaccination commenced (Ahmed *et al.*, 2000). The incubation period was between 1-3 months and mortality was 100%. Oboegbulem (1994) cited 6 cases of fatal rabies in children bitten by apparently healthy dogs. Bata *et al.,* 2011 reported 247 cases of dog bites in a year from a Veterinary clinic in Jos Plateau state. Ahmed *et al.,* 2000 also reported 900 cases in two hospital in 10 years in Sokoto Nigeria. Raghavan (2008) observed that some biting dogs remained healthy even after the children developed clinical rabies and populations of free-roaming owned dogs which are either never or occasionally restrained are largely accountable for dog bites to humans. One survey of apparently healthy dogs in Thailand revealed that 4 percent were carriers of rabies virus (Kaplan, 1969). Dog bites in humans are a serious public health problem and have been well documented worldwide (Overall and Love, 2001; Ozanne-Smith *et al.,* 2001). In the United States, 4.7 million people were estimated to have been bitten by dogs in 1994 (an incidence rate of 16.1/1000 in adults and 24.5/1000 in children), of whom 800,000 required

medical treatment (Sacks *et al.,* 1996). Later, a survey conducted during 2001–2003 in the USA estimated 4.5 million dog bites each year (an incidence rate of 16.6/1000 in adults and 13.1/1000 in children), an increase of 3% in adults and a decrease of 47% in children (Gilchrist *et al.*, 2008). There have been similar reports of human victims of dog bites in the United Kingdom (Morgan and Palmer, 2007), in the United Republic of Tanzania (Cleaveland *et al.,* 2002) and in Nigeria (Abubakar and Bakari, 2012). There are also several reports of dog bite incidents from other countries (Bhanganada *et al.,* 1993; Hossain *et al.,* 2011) but most cases are believed to be unreported, especially in developing countries.

The consequences of dog bites to humans are many. Although the most common issue is the direct physical injury, sometimes the injuries may cause permanent disfigurement of the victims requiring reconstructive surgery (Gilchrist *et al.*, 2008), psychological trauma and post-traumatic stress (Peters *et al.,* 2004; Schalamon *et al.,* 2006). Rarely attacks can be fatal. Dog bites also result in a large monetary expense for treatment, emergency hospitalization and post-exposure treatment for rabies (Sriaroon *et al*., 2006; Daniels *et al.,* 2008). Globally over 15 million people receive rabies prophylaxis annually, mainly for dog bite injuries (WHO, 2010). In addition, dog bite incidents also have direct impacts on the dogs involved in the bites, resulting in their relinquishment to shelters and euthanasia (Schalamon *et al.,* 2006). Legislative action (such as the Dangerous Dog Acts) have also been implemented in some developed countries to ban specific breeds of dogs because of the issue of increased bite incidents (Jackson, 2005); such legislation does not appear to have been effective in reducing the incidence and severity of the bites. However, the severity of dog bite incidents is striking in developing countries; majority of dog bite victims die from rabies infection. Like other

countries, dog bites are common in Nigeria because of the presence of a large number of stray dogs in the streets. .

One of the approaches to understanding the scale of human deaths due to rabies is the use of decision tree models. This methodology has been developed by Cleaveland *et al.* (2002) using active rabies surveillance data in Tanzania. The model is designed based on a series of probability steps using the distribution of bite injury on different body parts and the probability of developing rabies. More recently this decision tree model has been used by the World Health Organization to estimate human deaths from rabies in Asia and Africa overall. Globally, a total of 55,000 (90% CI: 24,000–93,000) human rabies deaths annually was predicted (Knobel *et al*., 2005).

### 2.4 Knowledge, Attitudes and Practices Towards Rabies

Knowledge, attitudes and practices (KAP) studies have been widely used around the world for different applications in public health based on the principle that increasing knowledge will result in changing attitudes and practices to minimize disease burden (Mascie-Taylor CG 2003) Other applications of KAP surveys include identifying knowledge gaps, cultural beliefs and behaviour patterns that may pose barriers to controlling infectious diseases (Krentel *et al* ., 2006), designing relevant public health awareness campaigns and provision of baseline data for planning, implementation and evaluation of national control programmes. KAP surveys have also been applied to the study of rabies (Matibag et al 2007). In order to control the disease, knowledge about rabies, proper and adequate pet care practices, and responsible dog ownership should be emphasized to the people, especially those in rural areas. Before beginning the process of creating awareness in any given community, it is first necessary to assess the environment in which awareness creation will take place (Kaliyaperumal, 2004). Conducting a KAP study can best do this? KAP study tells us what people know about

certain things, how they feel and also how they behave. The three topics that a KAP study measures are Knowledge, Attitude and Practice. The knowledge possessed by a community refers to their understanding of any given topic, rabies in this case. Attitude refers to their feelings towards this subject, as well as any preconceived ideas that they may have towards it. Practice refers to the ways in which they demonstrate their knowledge and attitude through their actions. Understanding the levels of Knowledge, Attitude and Practice will enable a more efficient process of awareness creation as it will allow the program to be tailored more appropriately to the needs of the community.

## 2.5 Aetiology of Rabies

The causative agent of rabies is a member of the *Lyssavirus* genus of the *Rhabdoviridae* family of bullet-shaped viruses, which have a single-stranded RNA genome. The genus includes the classical rabies virus (genotype 1) and six rabies-related viruses, Lagos bat virus (genotype 2), Mokola virus (genotype 3), Duvenhage virus (genotype 4), European bat lyssaviruses 1 and 2 (genotypes 5 and 6), and the Australian bat genotype 7 (Bishop *et al*., 2005; Swanepoel, 2005). Other genotypes include Irkut virus (IRKV), Aravan virus (ARAV), Khujand virus (KHUV) and West Caucasian bat virus (WCBV) (Kuzmin *et al.*, 2010). Rhabdoviruses are approximately 180 nm long and 75 nm wide. The rabies genome encodes five proteins: nucleoprotein (N), phosphoprotein (P), matrix protein (M), glycoprotein (G) and polymerase (L). All rhabdoviruses have two major structural components: a helical ribonucleoprotein core (RNP) and a surrounding envelope. In the RNP, genomic RNA is tightly encased by the nucleoprotein. Two other viral proteins, the phospoprotein and the large protein (L-protein or polymerase) are associated with the RNP. The glycoprotein forms approximately 400 trimeric spikes which are tightly arranged on the surface of the virus. The M protein is associated both

with the envelope and the RNP and may be the central protein of rhabdovirus assembly (Ruppert 1996).

### 2.5.1 Pathogenesis

The clinical course of rabies in dogs and that it could be transmitted by bite has been known for over 4000 years (Tierkel, 1975). The door to rabies pathogenesis was first opened by Zinke in 1804 who experimentally transmitted rabies by swabbing the saliva of a rabid dog unto fresh wounds of rabbits and dogs and showed that saliva contain the infectious agent (Pearce 2002)

Once the infection is established in the central nervous system, the virus spreads centrifugally to the salivary glands and other organs and tissues via peripheral nerves just as it had earlier travelled centripetally (Bishop *et al.*, 2005).

Rabies virus spreads from the site of infection to the CNS and back to the peripheral organs via the nerves. The dissemination of virus in peripheral tissues depends on the dose of inoculum and the length of incubation periods. A large inoculum produces a short incubation period and a rapid course of illness, leading to death before spread of virus throughout the brain. After long incubation periods, virus is distributed in many parts of the body. The ultimate distribution of viral infection depends upon the virus strain and the dose of inoculum used. (Fekadu *et al.,* 1982)

### 2.5.2 Transmission and epidemiology

Approximately 90% of all human cases of rabies in the world are attributed to rabid dogs (WHO, 2010). The infection is transmitted from one dog to another and from dog to man and domestic animals via bites (Ezeokoli and Umoh, 1987). It is also possible, that people may get rabies if infectious material from a rabid animal, such as saliva, gets directly into their eyes, nose, mouth, or a wound. (CDC 2011). Human to human rabies infection is very rare (Takayama 2005). There is a documented case where rabies

was transmitted by corneal transplants; the corneas came from donors who died with undiagnosed central nervous system diseases, and the recipients died from rabies 50-80 days later (Clark *et al*., 1975). In the USA, Canada, and Western Europe, where canine rabies has been controlled, dogs are responsible for very few cases. Rather, human rabies develops from bites of wild animals (especially bats, squirrels, rats, raccoons, skunks and foxes) or occurs in travellers bitten by dogs elsewhere in the world. (Dato *et al*., 1995, Smith, 1996.).

Despite the fatal outcome of the disease, rabies is maintained in urban areas by the presence of a significant proportion of susceptible dogs. The high density of dogs and their high rate of annual reproduction are important factors in the canine rabies epizootics in many parts of the world (Acha and Szyfres, 1980). Another important factor in maintenance of the virus is the long incubation period of the disease in some dogs. It has been demonstrated that the virus appears in saliva 2, 3, and even as long as 13 days before onset of the disease and that the agent may continue to be shed by this route until the animal dies (Acha and Szyfres, 1980). However, not all rabid dogs shed the virus through saliva, and hence some bites are not infectious. It is estimated that 60% to 75% of all rabid dogs shed the virus in saliva. Obviously, the risk of the virus being transmitted to man by a bite or through an abrasion is greater when the viral dose being shed is higher. Likewise, the risk of contracting the infection increases when the bite is on the face, neck, or hands and the risk reduces when it is on the trunk or lower extremities. Many minor bites or scratches fail to introduce enough viruses to cause disease, especially if the wound is inflicted through clothing (Fishbein and Robinson, 1993). Transmission can also occur when an infectious material (usually saliva or brain tissue) comes into direct contact with human mucosa or fresh skin wounds. Rabies is an ongoing scourge exacting an unnecessarily large toll on human life. It is estimated to

cause 30,000 deaths each year in India alone, while the World Health Organization estimates that between 35,000 and 50,000 rabies deaths occur worldwide annually (WHO, 1998; Haupt,1999). Rabies remains endemic throughout the world except for certain Western European countries and a number of Islands, but more than 99 % of all human rabies deaths occur in the poorest developing countries (Warrel and Warrel, 1988). Reasons underlying the preponderance of rabies cases in poor countries are complex, but include competing needs and limited resources for veterinary control, the prohibitive cost of post-exposure vaccine and immunoglobulin, inadequately trained health and veterinary staff, and inaccessibility of health-care facilities (Metzer and Rupprecht, 1998). Of considerable concern is the re-emerging status of rabies in Africa (Cleaveland, 1998). This trend has been attributed to rapid population growth with parallel dog population growth directed by security concerns, mobility of human populations' particularly political refugees, high rates of urbanisation and a disintegration of veterinary rabies control (Brooks, 1990). Rabies viruses are well adapted to persist in large populations of species with high intrinsic growth rates, that are capable of recovering rapidly after an epizootic wave has reduced population density to a level at which the basic reproductive rate of the disease falls below one (Wandeler, 2004). Despite being a highly fatal disease, which might threaten the survival of a host species, rabies virus has been able to survive because of limiting factors, such as transmission restricted to biting, and long incubations, allowing the virus to persist in a population temporally. Hosts which are not accustomed to biting other animals, such as man, are dead end hosts (Mantovani and Marabelli, 2004). An understanding of the importance of the virus-host-environment relationship is crucial to understanding the complex epidemiology of animal rabies (Seghaier *et al*, 1999). With developments in monoclonal antibody technology and gene sequencing, it is possible to

demonstrate that distinct variants of rabies viruses (Lyssavirus type 1) have become adapted to specific hosts.

## 2.6 Diagnosis of Rabies

There are no clinical or gross pathognomonic lesions for the diagnosis of rabies in animals, therefore, confirmation of infection can only be achieved by laboratory techniques (Anon, 2004a). Rapid and reliable laboratory confirmation of rabies using readily available, diagnostic assays is vital for the identification and control of disease. Results generated in the laboratory directly influence the decision whether or not to initiate control strategies and/or to continue with a course of treatment. Failure to identify the presence of rabies virus or virus antigen in a specimen by a single test does not necessarily confirm absence of infection (Anon, 2004a). Some assays are more sensitive and specific than others depending on the type of sample, the rabies genotype, and the stage of infection (Anon, 2004b). As a routine, more than one assay system should be employed simultaneously to increase the chance of making a rabies diagnosis and increase confidence in negative results. Rabies lesions, virus and virus antigen are reported to be particularly abundant in the thalamus, pons and medulla. The hippocampus, cerebellum and various regions of the cerebrum have been reported to be negative in 3.9-11.1% of rabies positive brains (Anon, 2004b). Although the thalamus has been reported to be the most likely positive tissue, a pool of brain tissue including the brainstem should be used for laboratory examination (Bingham and Merwe, 2002). Occasionally, virus antigen or infectious virus can only be detected in the salivary glands. Examination of salivary glands can also provide valuable epidemiological information on the excretion of virus by different vertebrate species (Bingham and Merwe, 2002).

### 2.6.1 The Fluorescent Antibody Test (FAT)

The FAT as first described by Goldwasser and Kissling, (1958), and later modified by Kissling, (1975) and Dean *et al.,* (1996) is still the most widely used test for rabies diagnosis. The test, often referred to as the gold standard for rabies diagnosis is recommended by WHO and OIE (Anon, 2005). Interestingly, the results of a survey of different testing laboratories assaying samples with public health implications revealed that a number of divergent modifications were being made to virtually every step of the test (Smith, 1995). Virus antigen can be confirmed directly in brain impressions, composite brain smears, frozen sections and the brains of mice used for virus isolation. Rabies antigen can also be detected in salivary glands (Goldwasser and Kissling, 1959). The inclusion bodies frequently lose their intracellular position in impression smears, so much so that the structures demonstrated by immunofluorescence range from the characteristic Negri bodies to fine particles. Microwave fixation has been used successfully as an alternative to acetone fixation of tissues for examination by immunofluorescence (Davis and Neill, 1997). The FAT is also ideally suited for the confirmation of virus antigen in acetone-fixed cell cultures.

## 2.7 Control and Prevention of Rabies

Rabies in domestic and wild animals represents a significant threat to public health and can cause economic losses among livestock. Animal rabies control consists of the vaccination of dogs and cats, the elimination of stray animals, health education for the public, etc. In some countries, mass vaccination of dogs is not implemented, and the effective coverage rate is not exactly known. The elimination of stray dogs and other animals by shooting and poisoning is still implemented in certain countries; however, this has a minimal effect on rabies transmission (Knobel *et al*., 2005). Preventive

vaccination against rabies virus is a highly effective method for preventing rabies in humans and animals (Jakel *et al*., 2008). For travel purposes, vaccination of domestic carnivores is obligatory. In addition, some countries require testing for neutralizing antibodies against rabies. The minimal threshold level accepted by WHO/OIE is 0.5 IU/ml. Despite proper vaccination some animals do not reach the threshold (Jakel *et al*., 2008). Despite the availability of effective human and animal vaccines against rabies, and other measures for its control, rabies continues to account for at least 55,000 human deaths each year, mainly in the developing countries of Africa (Knobel *et al.,* 2005). In these countries, most human rabies infections result from exposure to infected dogs, by bites, scratches, and mucosal exposures (Cohen *et al.,* 2007). Rabies vaccination of animals and post exposure prophylaxis (PEP) for humans is prohibitively expensive for most African governments, and it has long been contended that the effects of rabies are underestimated in Africa (Cohen *et al.,* 2007) Since the dog has been established as the predominant vector of rabies in Nigeria, the most logical and cost–effective approach to rabies control is elimination of stray and ownerless dogs combined with a programme of mass immunization in the shortest possible time, targeting at least 80% of the entire dog population (Awoyomi *et al*., 2007). Dog rabies control relies principally on the mass immunization of dogs in order to achieve population immunity levels sufficient to inhibit rabies transmission (Perry and Wandeler, 1993). Although highly effective if administered correctly, post exposure prophylaxis is much more costly than vaccination of domestic dogs (Rupprecht and Gibbons, 2004; Cohen *et al*., 2007).

### 2.7.1 Post- Exposure treatment in man

In man, combined active and passive immunisation shortly after exposure mediates the elimination of virus before it enters the nervous system (Wandeler, 2004). Treatment

for the prevention of rabies in humans exposed to rabies should begin as soon as possible after the exposure occurs. Treatment should consist of thorough wound cleansing using soap, water and a virucidal antiseptic (povidone, iodine or ethanol) followed by the administration of rabies passive immunization and cell culture or purified embryonated egg rabies vaccine of proven efficacy (WHO, 2004).

### 2.7.2 Post- exposure treatment of dogs by vaccination

Vaccination in already infected animals does not significantly alter the clinical picture or development time of the disease (Fooks and McElhinney, 2000). This is in contrast to prompt post-exposure prophylaxis in man, which is effective after natural infection. It is possible that an animal infected before vaccination would continue to incubate the disease despite developing a high antibody titre (Fooks and McElhinney, 2000).

# CHAPTER THREE

## 3.0 MATERIALS AND METHODS

### 3.1 Study Area

The study area was Lokoja (Figure 1), a town, river port, Local Government headquarters and the capital of Kogi State, located at North Central Nigeria, on the west bank of River Niger opposite the mouth of River Benue. The town was discovered in 1877 by a Scottish explorer, Balfour Baike. It is located in the middle belt of Nigeria, in the present North Central region of the country. The town was a former capital of the British Northern Protectorate and it also remained a convenient administrative town for the British colonial government after the amalgamation of the northern and southern protectorates into one nation called Nigeria in 1914. It has a population of 195,261 (National Population Commission, 2006) and lies within longitude $7^0$48'' N of the equator and latitude $6^0$ 44'' E of the Greenwich Meridian. The town is bounded to the north by Niger State and on the east upstream by Kwara State, the south by Adavi, Ajaokuta and Okehi Local Government Areas and the west by Kogi Local Government Area. It has a land mass of 3,180 square kilometres (en-wikipedia.org/wiki/Lokoja). Lokoja also serves as a gateway to the Nation's capital from the eastern and the southern states of the Federation. There is a Federal Medical Centre, a General Hospital, two State Veterinary Clinics, Private Veterinary Clinics, a Federal University and the State Polytechnic in the town. Dogs are slaughtered at the Army Barracks in Lokoja for human consumption.

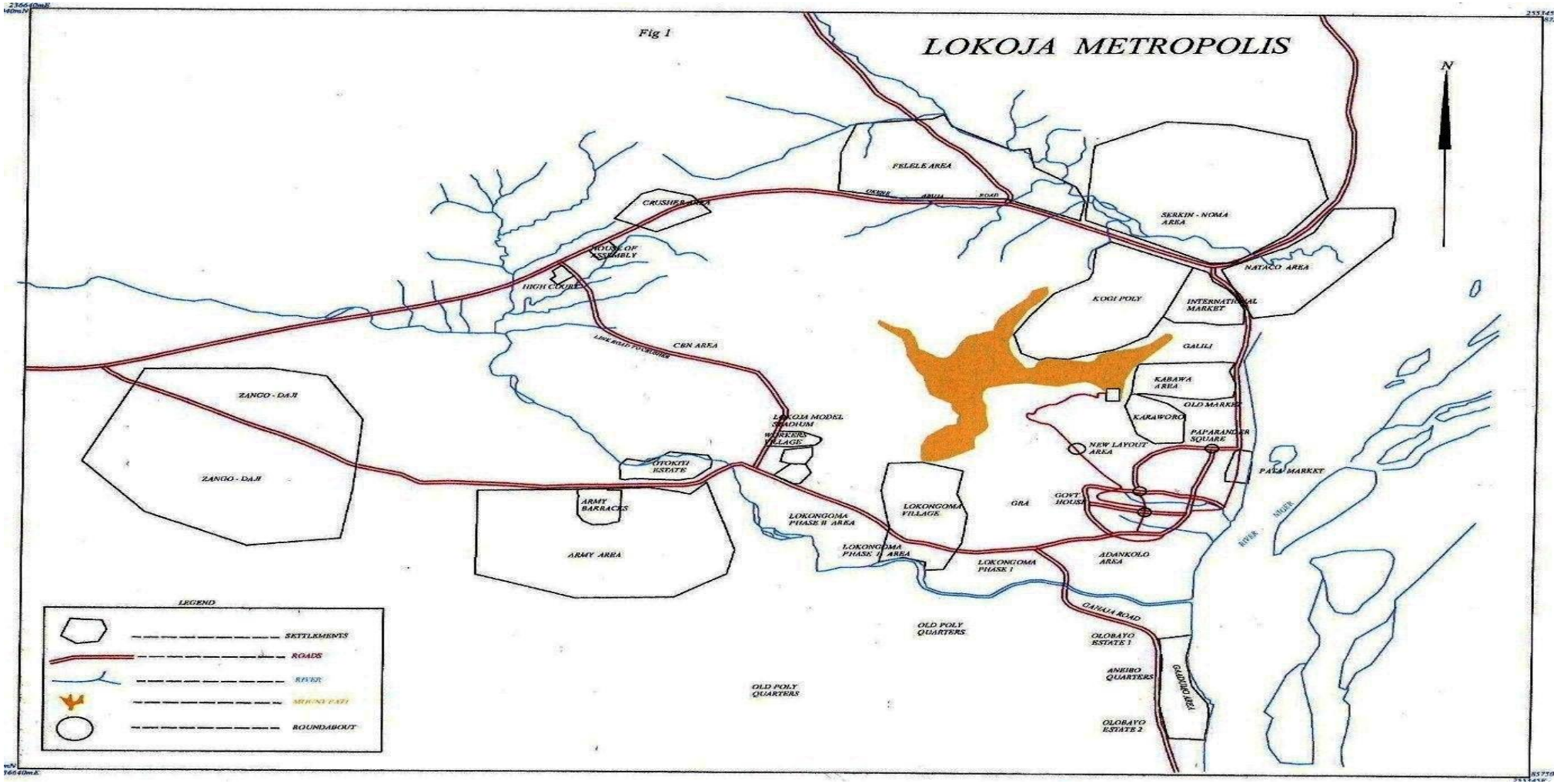


**Figure 3.1: Map of study area.**

Source; Ministry of Lands and Survey Lokoja

## 3.2 Study Design

A retrospective study was used to evaluate dog bite cases, dog vaccination records while a cross sectional study was carried out to assess dog ecology, the knowledge, attitude and practice of dog owners, and detection of rabies antigen in the brain of slaughtered dogs in Lokoja, Kogi State

## 3.3 Dog Ecology

Stratified random sampling was used to carry out this study. The sampling frame is Lokoja, Kogi State. There are a total of 350 streets in Lokoja metropolis (Ministry of Lands and Surveys) , out of which thirty five (10%) were sampled. Using a detailed map of Lokoja Township obtained from the Ministry of Lands and Housing, the various socio- economic and Land use districts were plotted and the town was stratified into six areas for the purpose of this study. The areas are G.R.A., Lokoja main town consisting of Adankolo, Adankolo new layout, Ganaja which include Ganaja Village, Gadumo and Ganaja Road, Otoikiti, Kabawa and Felele. Six streets in each of the six selected areas were chosen for the enumeration of dogs. The population estimate of dogs was carried out by street count of dogs and additional information was obtained from the questionnaire.

### 3.3.1 Dog population enumeration by Street count

Dogs were counted in the early hours of the morning between 6.00am – 8.00am because there is less human activity, good visibility and maximum dog activities during this time (Okoh, 1986). Dogs were counted for three consecutive days to reduce error and the counts averaged. All dogs within a given distance were photographed and recorded. The number of counted dogs in the selected streets was used to estimate the population of dogs in the area using the formula;

$N = \sum (Mn)/\sum m$ (Becks, 1984)

Where,

N = Population estimate

M = number of dogs photographed each time and considered marked (observed)

m – Number of dogs recognised as previously observed (re-observed)

n – Is the total number of dogs previously observed i.e. each dog observed (M) less those previously observed (m) was added to each day.

Mn – the product of each days M and n

$\sum$ (Mn) - the summation of Mn to that point in time and

$\sum$m – the summation of the number of dogs previously recognised to that point in time.

An estimate of the entire dog population within the metropolis was determined from all counts obtained.

### 3.3.2 House to house survey of dog population using questionnaires

Questionnaire (Appendix I) for gathering dog population data and for assessing human attitude towards dog was used in this study. The questionnaire survey was done on the same area as of street count. An adult and literate member of the household was interviewed using questionnaire designed for dog population survey (WHO & WSPA, 1990). The questionnaire consisted of four parts: section A. covers information about the household and biodata of the respondents, section B was concerned with management of dogs, section C on vaccination and section D on cases of dog bite, management and consequences (Appendix I). In some cases the questions was read to the respondents and the answers they gave were filled in appropriately. The interviews were conducted in the local languages namely Igala, Igbirra, Hausa but later translated to English depending on the situation.

An adult member of each fifth compound on each side of the selected street was interviewed for 10 minutes using the questionnaire designed for compound survey. In the absence of an adult or household head the next most senior member of the household was interviewed. Each household interviewed was asked about the number of people living on the premises. A total of 210 copies of the questionnaire were administered to 210 households

### 3.4 Records on Dog Bite Cases and Dog Vaccination

Primary clinical dog bite cases on humans' between 2003 and 2013 were assessed and analysed from the State Veterinary Clinic. Information on rabies vaccination status was also obtained from the State Veterinary Clinic and the Animal Friend Veterinary Clinic (AFVC) located in the study area, (Lokoja). The existing vaccination records for a period of eleven years (2003-2013) were evaluated. Records of age, sex, breed and the number of dogs vaccinated were assessed. The age and sex of dog bite victims, the site of bite and season of occurrence of dog bite were also assessed.

### 3.5 Knowledge, Attitude and Practice

A questionnaire (Appendix II) was prepared, pretested on 20 respondents and after validation was administered to four hundred (400) residents within the study area using face to face interview. The questionnaire was administered to residents of Lokoja who are present and willing to participate at the time of the survey. Twenty (20) houses each on twenty (20) streets in ten (10) of the sixteen (16) residential areas were chosen. Systemic random sampling was done where the tenth house on the chosen street was sampled. The question on knowledge, attitudes and practices required "Yes" "No" and "Undecided" responses. A marking scheme containing expected correct answers was prepared and used to mark and score the responses. Undecided were considered wrong response/ answer. For each correct and incorrect answer one or zero points were

assigned respectively. A higher score indicated greater level of knowledge, positive attitudes or acceptable. The questionnaire was divided into four (4) sections (Appendix II). The demographic information or data of the respondents was contained in Section A, which includes (name, age, sex occupation, number of children, level of education etc. Information about the knowledge of rabies was contained in Section B which includes questions about means of transmission of rabies, vaccination, symptoms/clinical signs of rabies, prevention and control. Questions about attitude of respondents towards rabies was provided in Sections C and this included attitudes concerning stray dogs, confined dogs, dog bites, keeping unvaccinated dogs and children playing with dogs. Section D contains questions on practice of respondents towards rabies and this included practice of keeping and handling dogs, dog bite wounds and/or victims.

## 3.6 Dog Brain Tissue Sampling, Collection and Processing

### 3.6.1 Sample size determination

The sample size was determined by using the formula by Thrusfield (2007)

$$N = \frac{Z^2 P (1-P)}{d^2}$$

Where n = Sample size

Z= 1.96 standard normal value for desired confidence (normal distribution table)

P= prevalence rate (15.8%) Akombo, 2009, (Benue State), since there is no record of any prevalence rate for Kogi state

d = desired absolute precision (0.05)

$$\frac{1.96^2 \times 0.158(1- 0.158)}{0.05^2}$$

= 204.44

### 3.6.2 Sample collection

A total of 205 brain tissue samples from slaughtered dogs were collected between July, 2014 and September, 2015 from various slaughter points (relaxation places called 'Joints' where dogs were slaughtered and processed for consumption) within the study area. Information on the source and sex of the dogs presented for slaughtering was obtained. The dog heads were bought and brain samples were collected. Each slaughter point was visited twice daily (morning and afternoon) and the dog heads were collected based on availability. The samples obtained were stored on ice in cold flask containers to maintain cold chain. All the samples were transported to the Viral Zoonoses Laboratory of the Department of Veterinary Public Health and Preventive Medicine, Ahmadu Bello University, Zaria for fluorescent antibody test as described by Dean *et al*. (1996).

### 3.6.3 Fluorescent antibody test procedure and interpretation of results.

Rabies direct fluorescent antibody test (DFAT) monoclonal antibody conjugate reagents (Fujirebio Diagnostic Inc. Malvern, USA) was used and the working reagents dilution prepared according to manufacturer's recommendation, as described by Flamand *et al*. (1980). For each of the brain tissue, impression smear was made on a glass slide and then air dried and fixed in cold acetone for one hour at -20$^{o}$C. The slide was brought out and then air-dried for 3 minutes and two drops of the rabies conjugate 1:40 working dilution was applied using a micro pipette. The slide was incubated for 30 minutes at 37$^{o}$C in a humid chamber after which excess conjugate was removed from the slides by rinsing it with PBS (pH 7.4) for about 5 minutes and allowed to air dry. The slides was then be examined using a fluorescence microscope within 2 hours after staining. The presence of brilliant apple green fluorescence or greenish-yellow objects

against a dark background is regarded as positive result for rabies while absence of specific apple green fluorescence was regarded as negative for rabies (Flamand *et al.,* 1980).

### 3.6.4 Data analysis

In this study, data generated was analysed using the Statistical Packages for Social Sciences (SPSS) Version 17.0 to carry out descriptive analysis. Chi-square test was used to test for association between categorical variables. A value of $p < 0.05$ was considered significant. Data on dog ecology were summarised into tables to show dog counts on the streets and also compound survey. Data on dog bites were also reduced and presented as tables and graphs to show distribution by age, sex and site of bite on the victim. Time series analysis using ratio to moving average was carried out to reveal seasonal variations of dog bites. Data on vaccination were expressed as tables and graphs to reveal distribution by age, sex, breed and number of dogs vaccinated per year. The levels of knowledge, attitude and practice (KAP) of the respondents were assessed by marking the responses using a marking scheme of correct answers. Scores from KAP were categorized as follows: knowledge: 14-17 (Very good), 9-13 (Good), 4 - 8 (Fair) and 0 - 3(Poor). Attitude: 7-9 (Very good), 5-6 (Good), 3-4 (Fair), 0-2 (Poor).Practice: 8 - 10 (Very good), 5 - 7 (Good), 2 - 4 (Fair), 0-3 (Poor). Scores in the category of 'poor and fair' were merged together and regarded as unacceptable while the score for 'good and very good' were merged together and regarded as acceptable. Associations of demographic variables with categorized scores were assessed as acceptable and unacceptable using frequencies.

The rate of rabies antigen detection was calculated as a proportion of the total number of dogs to be examined.

# CHAPTER FOUR

## 4.0 RESULTS

## 4.1 Dog Ecology

### 4.1.1. Direct street counts of dogs

A total of 35 streets (10%) were selected from 350 streets from which 778 dogs were counted. Males were 444 (57.0%) and females were 334 (43%), the ratio being 1.33:1 (Table 4.1). In areas such as G.R.A. and the Lokoja main town, fewer dogs were seen on the streets as most of the dogs were confined in their houses.

### 4.1.2 House to house survey of dogs in Lokoja

A total of 295 dogs were counted in the house to house survey of dogs in the five chosen areas of Lokoja town. Males accounted for 180 while the females were 115, and are in a ratio of 1.6:1 (Table 4.2). A total of 1,212 people were counted in 207 household that participated in the survey with a human to dog ratio of 4.1:1

### 4.1.3 Dog population structure in Lokoja

The breed and sex distribution of dog population in this study shows that majority of dogs kept were indigenous breed (67.4%). Most respondents prefer males (61.4%). Dogs are kept mostly for security of homes and properties (56.9%) and pets (31.9%) compared to other uses like herding (4.2%) {Table 4.3}

### 4.1.4 Management and care of dogs in Lokoja

Among the respondents only 17.4% of the populace reported that their dogs were always restrained, majority (47.9%) have their dogs totally unrestrained. Some of the

respondents (4%) have no knowledge of where their dogs sleep (Table 4.4). In majority of the household (41.0%) all members were recognisable for caring for the dogs while in 37.4% of the households only the father provided care. Most respondents do not feed their dogs well as they responded that the dogs were fed with family left over (68.8%), leaving the dogs hungry most of the time as the leftover are usually not enough for them. These dogs were left to wander on the streets looking for food in refuse dumps thereby increasing their chances of acquiring and transmitting rabies. Only 7% of the respondents agreed that their dogs were feed with commercial feed and 26.4% cooked food especially for the dogs. Depopulation of dogs is mainly by giving away either for a token amount of money or as gifts to family or friends (56.3%) while 23.6% responded that they lose puppies to death due to disease (Table 4.4)

**Table 4.1: Direct Street Count of Dogs in Lokoja Metropolis**

| Wards | Male | Female | Total |
|---|---|---|---|
| Ganaja | 98 | 81 | 179 |
| Kabawa | 75 | 60 | 135 |
| Otoikiti | 68 | 41 | 109 |
| G.R.A | 55 | 37 | 92 |
| Lokoja Main | 50 | 45 | 95 |
| Felele | 98 | 70 | 168 |
| | 444(57.0%) | 334(43.0) | 778 |

**Table 4.2: Compound Dog Counts In Lokoja Metropolis**

| Area | Females | Males | Total |
|---|---|---|---|
| Ganaja | 15 | 28 | 43 |
| G.R.A | 10 | 28 | 38 |
| Felele | 21 | 31 | 52 |
| Otoikiti | 28 | 32 | 60 |
| Lokoja main | 19 | 32 | 51 |
| Kabawa | 22 | 29 | 51 |
| Total | 115 | 180 | 295 |

**Table 4.3: Structure Of Dog And Human Population Structure In Compound Count Carried Out In Lokoja.**

| Parameters | Scores |
|---|---|
| No of compounds interviewed | 207 |
| Total persons in all compounds | 1,212 |
| Total no. of Dogs in all compounds | 295 |
| Average number of dog per house | 1.4 |
| Human to dog ratio | 4.1:1 |
| 2006 population census of Lokoja | 195,261 |
| Estimated dog population in Lokoja | 47,265 |
| **Sex Distribution** | |
| Male | 180(61.4) |
| Female | 115(38.6) |
| Male to Female ratio | 1.6:1 |
| **Breed Distribution** | |
| Indigenous | 97(67.4) |
| Exotic | 28(19.4) |
| Crosses | 19(9.2) |
| **Function** | |
| Security | 82(56.9) |
| Pet | 46(31.9) |
| Hunting | 10(6.9) |
| Herding | 6(4) |

**Table 4.4: Management And Care Of Dogs In Lokoja. Kogi State**

| Parameters | Scores (%) |
|---|---|
| **Confinement** | |
| Never | 69(47.9) |
| Partial | 46(31.9) |
| Always | 25(17.4) |
| Unknown | 4(2.8) |
| **Care providers** | |
| Father | 50(37.4) |
| Mother | 13(9.0) |
| Children | 22(15.3) |
| Everybody | 59(41.0) |
| **Feeding** | |
| Family leftover | 99(68.8) |
| Cook special food | 38(26.4) |
| Buy commercial food | 7(4.9) |
| **Causes of dog depopulation** | |
| Giving away | 81(56.3) |
| Disappear | 23(16.0) |
| Intentional killing | 2(1.0) |
| Automobile accident | 3(1.4) |
| Death due to disease | 34(23.6) |

### 4.1.5 Knowledge on Cases of Dog Bites Management and Consequences in Lokoja

The respondents that reported that a family member have ever been bitten are 58 (28%), while majority 149 (73%) of the total of 207 respondents had not experienced dog bite. Among this respondents household and neighbour's dogs account for 68% of such bites, while 28.8% were bitten by stray dogs (Table 4.5). Majority of the respondents 22 (44.9%) said the victims were treated with anti-rabies post exposure prophylaxis however 17 (34.7%) treated the bite wounds locally, 6(12.2%) used traditional herbal dog bite treatment and 4(8.2) % did not treat at all. Amongst the victims of dog bites 44(89.8%) were healthy while 3(6.1%) died and 2(4.1%) of the respondents claimed that they did not know what happened to the victims. Just one of the victims that died displayed abnormal behaviour

**Table 4.5: Knowledge on Cases of Dog Bites Management and Consequences in Lokoja Metropolis**

| Parameters | Score (%) |
|---|---|
| **Family member bitten by a dog** | |
| Bitten | 58(28) |
| Not bitten | 149(72) |
| **Owner of offending dog** | |
| Household | 14(26.9) |
| Neighbour | 22(42.3) |
| Stray dogs | 15(28.8) |
| **What happened to the dog?** | |
| Died | 6(11.8) |
| Killed | 7(13.4) |
| Healthy | 25(49.0) |
| Unknown | 13(22.5) |
| **Treatment given to the victim** | |
| Anti-rabies post exposure prophylaxis | 22(44.9) |
| Local wound treatment | 17(34.7) |
| Traditional (herbal) dog bite treatment | 6(12.2) |
| Non | 4(8.2) |
| **What happened to the Victim?** | |
| Healthy | 44(89.8) |
| Died | 3(6.1) |
| Unknown | 2(4.1) |
| **If the victim had died, was there any abnormal behaviour seen?** | |
| Yes | 1(25) |
| No | 3(75) |

## 4.2 Vaccination of Dogs

The annual rabies vaccination profile showed that out of 4281 cases presented to the clinics in Lokoja during the period under review, 1339(31.2%) dogs received anti-rabies vaccination (Table 4.6). The available records indicated that more male dogs 772(57.7%) were vaccinated compared to females 571(42.3%) {Table 4.7}.Most of the dogs 688(51.3%) vaccinated were within the ages of 3-12 months followed by 426(31.8%) dogs in the ages range >12- 36 months and 230(17.1%) dogs in the range of > 36 months (Table 4.7). From dogs vaccinated at the clinics indigenous breed of dogs had the highest vaccination rate 407 (43.71%) while 360 (31.3%) and 230(25%) of the vaccinated dogs were exotic and crosses respectively (Figure 4.1). There was statistically significant differences in the mean frequency of dog vaccination between male and female dogs. (t =4.277 *df* 10, p 0.002 p > 0.005)

## 4.3 Human Exposure

The results of distribution of dog bite based on age of persons bitten showed that out of 94 reported cases from 2003-2013, 8 (8.4%) were victims above 30 years while 15 (15.8%) were victims between 20-30 years of age, 46(48.4%) and 26(27.3%) represent persons between 10-19 years and less than 10 years of age respectively(Table 4.8). Occurrence of dog bite among persons in relation to sex revealed that males had higher frequency 57(60%) than females 38(40%) [Table 4.8]. The anatomical location of the bite indicated higher frequency on the legs 51(50.5%) than other parts of the body gluteal area (buttocks) 30(30.5%), hands 7(14.7%) head 2(2%) and back 5(2.1%) [Fig.4.3]. Monthly distribution of dog bites indicated that the highest frequency of dog bite cases occurred in the months of October and February peaking in January with 13 (14%) followed by November with 10 (10.9%) and December had 12 (13%) while the

least cases of dog bite was in the month of April with 4 (4%) [Table 4.9]. Time series decomposition using ratio to moving average method revealed seasonal fluctuations (Fig.4.4). Seasonal changes expressed as seasonal index showed the greatest values

**Table 4.6: Annual Anti-Rabies Vaccination in Dogs at Lokoja 2003 – 2013**

| S/N | Number of Cases | Number of ARV | Percentage% |
|---|---|---|---|
| 1 | 355 | 116 | 32.7 |
| 2 | 406 | 123 | 30.2 |
| 3 | 395 | 128 | 32.4 |
| 4 | 402 | 130 | 32.3 |
| 5 | 325 | 121 | 37.2 |
| 6 | 359 | 128 | 35.7 |
| 7 | 417 | 113 | 27.0 |
| 8 | 407 | 119 | 29.2 |
| 9 | 329 | 92 | 28.0 |
| 10 | 426 | 134 | 31.5 |
| 11 | 460 | 135 | 29.3 |
| TOTAL | 4281 | 1339 | 31.2 |

Key; ARV means Anti- rabies vaccine

**Table 4.7: Distribution of Sex of Dogs Vaccinated Against Rabies by Sex, Age and Breed in Lokoja from 2003 -2013**

| Variable | Frequency No (%) |
|---|---|
| **Sex** | |
| Male | 772(57.7) |
| Female | 571(42.3) |
| **Age** | |
| 3 -12 | 688(51.3) |
| >3 -36 | 422(31.8) |
| >36 | 230(17.1) |
| Breed | |
| Exotic | 419(31.3) |
| Local | 585(43.7) |
| Cross | 335(25.0) |

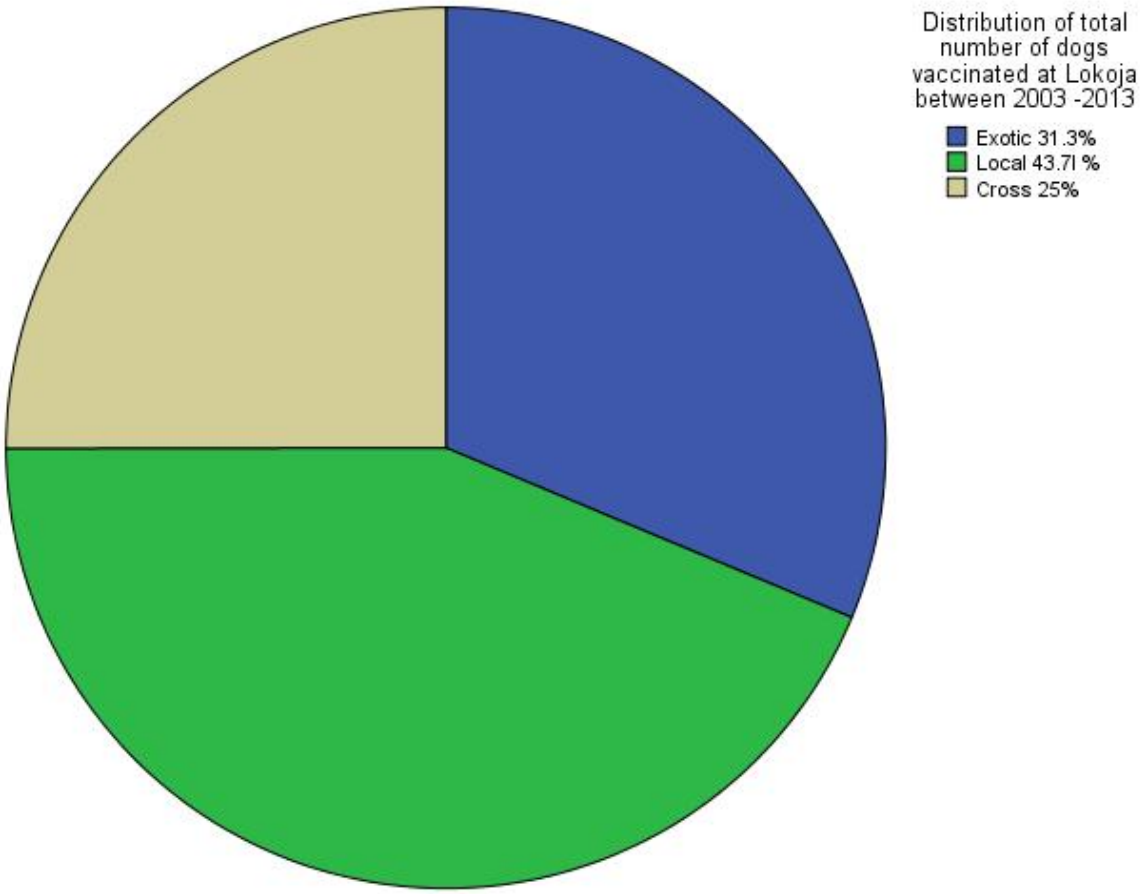


**Figure 4.1: Distribution of total number of dogs vaccinated in Lokoja**

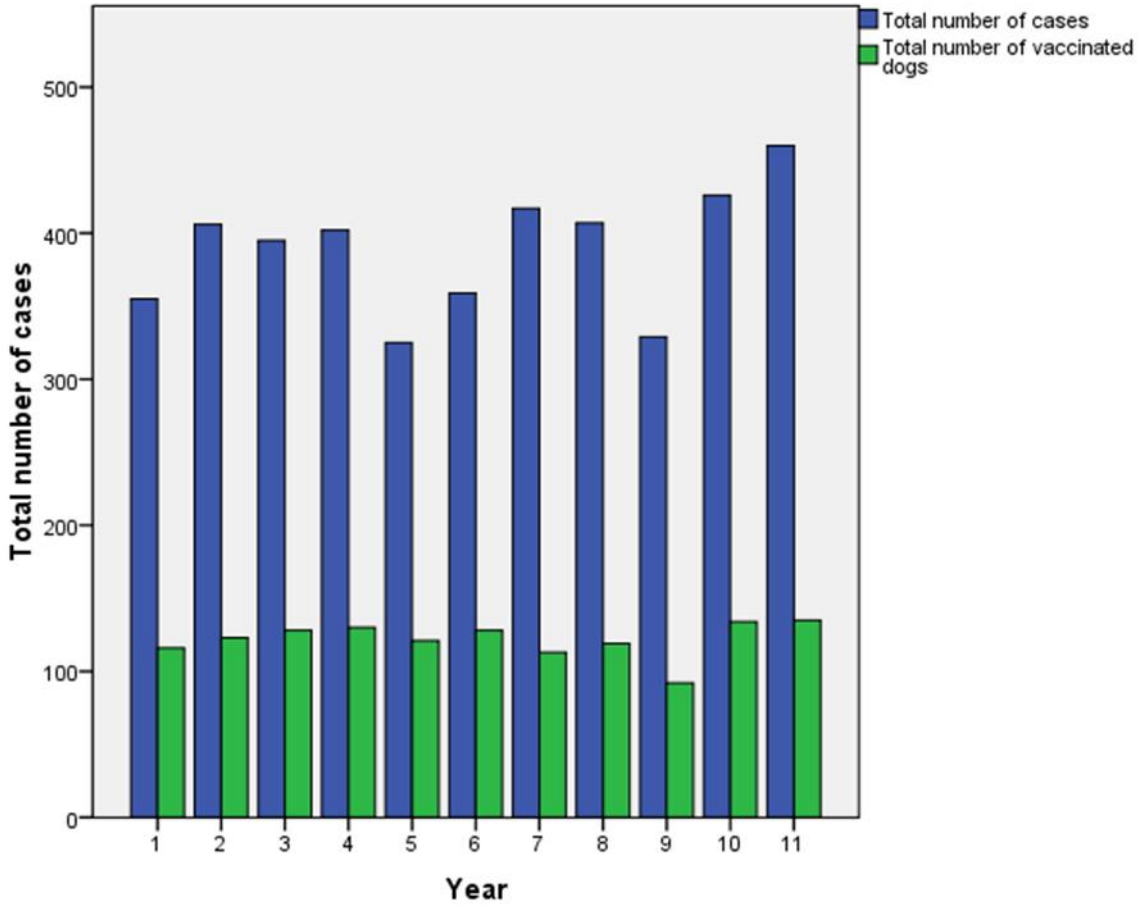


**Figure 4.2: Annual Distribution of Total Number of Dogs Presented and Dogs Vaccinated Against Rabies in Lokoja**

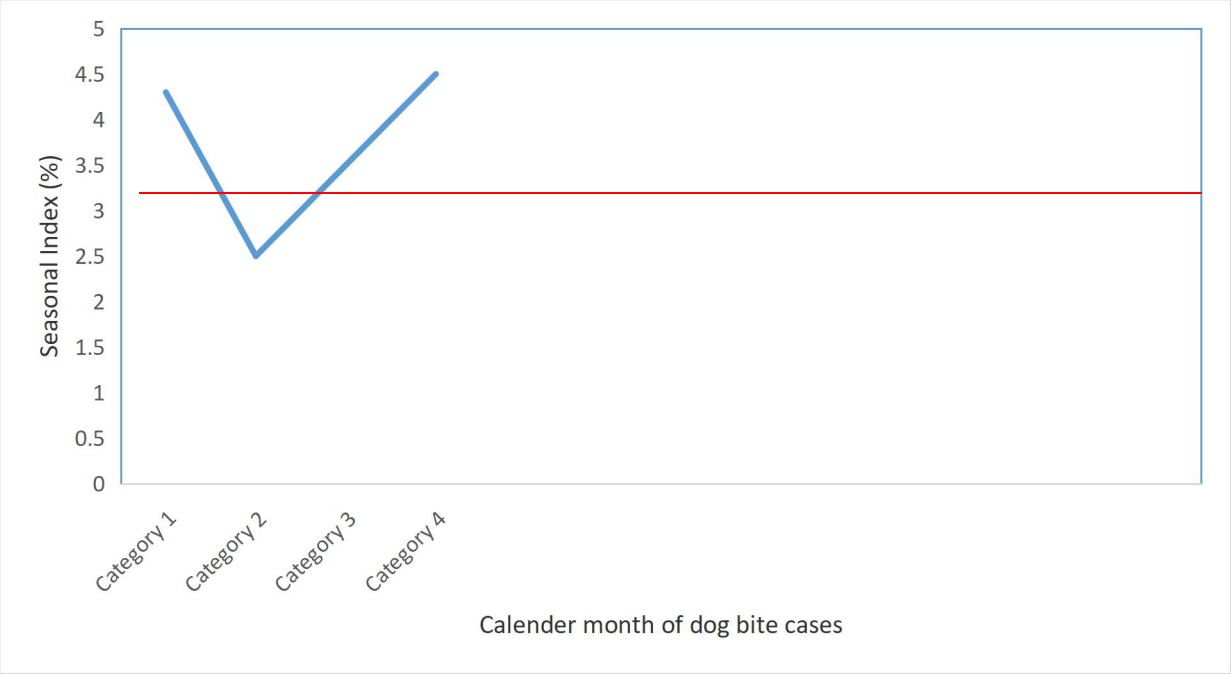


**Figure 4.3: Seasonal index of dog bites cases in Humans in Lokoja**

**Table 4.8: Distribution of Dog Bites in Humans by Age and Sex of Bite Victims in Lokoja Kogi State**

| Year | Age (Years) | | | | Sex | |
|---|---|---|---|---|---|---|
| | <10 | 10-19 | 20-29 | >29 | M | F |
| 2003 | 2 | 5 | 0 | 1 | 5 | 3 |
| 2004 | 0 | 3 | 1 | 0 | 3 | 1 |
| 2005 | 3 | 4 | 0 | 0 | 5 | 2 |
| 2006 | 2 | 3 | 2 | 1 | 5 | 3 |
| 2007 | 3 | 4 | 0 | 0 | 7 | 0 |
| 2008 | 4 | 6 | 3 | 2 | 8 | 7 |
| 2009 | 1 | 5 | 3 | 1 | 6 | 4 |
| 2010 | 2 | 4 | 0 | 0 | 3 | 3 |
| 2011 | 5 | 5 | 3 | 2 | 8 | 7 |
| 2012 | 2 | 3 | 0 | 1 | 3 | 3 |
| 2013 | 2 | 4 | 2 | 0 | 5 | 3 |
| **Total** | **25** | **46** | **15** | **8** | **57** | **38** |
| **%** | **27.4** | **48.4** | **15.8** | **8.4** | **60** | **40** |

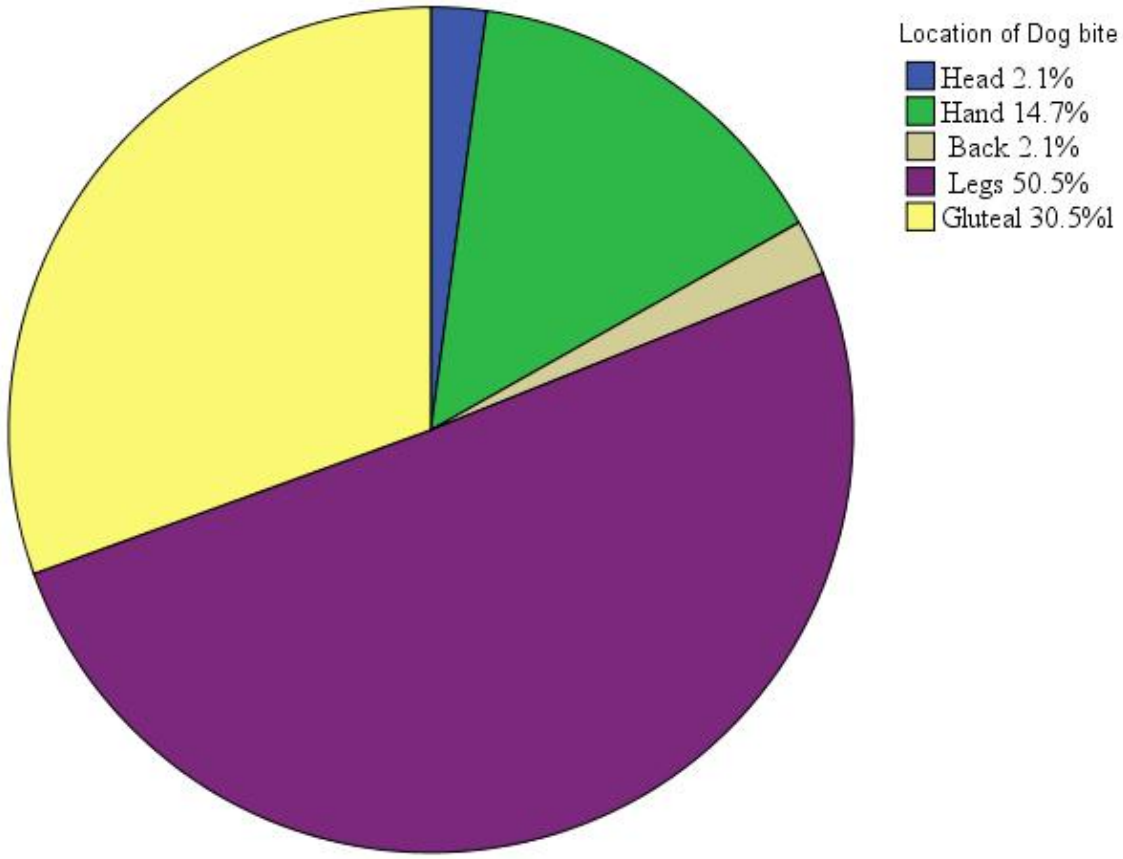


**Figure 4.4: Distribution of Dog Anatomical Position on Humans in Lokoja between 2003…**

**Table 4.9: Monthly Dog Bite Cases in Humans Reported To the State Veterinary Clinic Lokoja from 2003 - 2013**

| Year | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003 | 0 | 2 | 1 | 0 | 2 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 8 |
| 2004 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 4 |
| 2005 | 1 | 1 | 2 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 7 |
| 2006 | 1 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 1 | 1 | 1 | 1 | 8 |
| 2007 | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 1 | 7 |
| 2008 | 2 | 0 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 0 | 1 | 2 | 15 |
| 2009 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 1 | 2 | 10 |
| 2010 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 6 |
| 2011 | 2 | 1 | 1 | 0 | 0 | 1 | 0 | 2 | 2 | 2 | 2 | 3 | 15 |
| 2012 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 6 |
| 2013 | 0 | 2 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 8 |
| Total | 13 | 8 | 9 | 4 | 6 | 6 | 5 | 6 | 7 | 8 | 10 | 12 | 94 |
| % | 14 | 9 | 10 | 4 | 6 | 6 | 5 | 6 | 7 | 6 | 13 | 13 | 100 |

## 4.4 Knowledge, Attitude and Practice.

### 4.4.1 Demographic characteristics of respondents

Four hundred (400) respondents participated in the study, of which 254(63.5%) were males and 146(36.5%) were females. Respondents of >19years were 31 (7.8%), 20-30 years were 159(39.8 %), 30-40 years 104(26.0%) and those above 41 years were 89(22.3%). Based on marital status, 169(42.3%) were singles, 212(53%) were married and 18 (4.5%) were divorced. Based on occupation of respondents 129(32.3%) are engaged in multiple businesses 151(37.8%) were civil servants, unemployed were 93(23.3%) and farmers were 27(6.8 %.). Of the 400 respondents 18 (4.5%) had no formal education, those who acquired primary education were 22(5.5%) and while majority had both secondary 108(27%) and tertiary education 252 (63%).Respondents without children were 178 (44.8%) while those with one child were 30 (7.5%) two children 62(15.5%) and those with three were 98(24.5%) and greater than 3 were 31 (7.8%).The respondents who are Christians 276(69%) keep dogs more than the Muslims 121(30.5%) while the other religion are 2(0.2%)in this study. Respondents with dogs were 196 (49%) while those without dogs are 204 (51%). Respondents who reported being previously bitten by a dog were 115(28.8%) while 285(71.3%) reported that they were never bitten.

### 4.4.2 Knowledge of respondents towards rabies

Based on the knowledge about rabies, majority of the respondents who said that rabies cannot kill were 241(60.3%) while 131(32.8%) knew that rabies can kill and 28(7%) were undecided. 310 (77.5%) said that the organism that causes rabies affects the nerves while 47(11.8%) disagreed and 43(10.8) were undecided. A few 22(5.5%) said that rabies does not exist in Nigeria while a majority 308(77%) knew that it exist and 70(17.5%) were undecided. Majority of the respondents 310 (77.5%) said that dogs are

possible common source of rabies in Nigeria. Majority 203(50.8%) said that all humans can be infected with rabies while 131(32.8%) disagreed and 44(11%) were undecided. Respondents who affirmed that a friendly dog that suddenly turned aggressive might have rabies were 301(75.3%). Majority of the respondents 179(44.8%) knew that excessive foamy salivation and tendency to bite anything were signs of rabies in dogs 79(19.8) were undecided and 142(35.5%) disagreed. When asked, if non vaccination of dogs against rabies is against the law, 273(68.3%) of the respondents said yes, while 81(20.3%) disagreed and 46(11.5%) were undecided. There were statistically significant differences between these responses ($\chi 2$=224.04, df= 2, p= 0.000). Respondents who thought that dog registration and licensing cannot help in the control of rabies were 175(43.8%) while 133(33.3%) agreed that dog registration and licensing can help in rabies control .There was statistically significant difference between these responses ($\chi 2$=25.83, df= 2, p=0.00). [Table 4.11].

The association of demographic characteristics of respondents with categorized knowledge scores was assessed (Table 4.12). The result showed that respondents in the age category of between 20 - 30 years of age had the higher knowledge scores 122(76.7%). There was no significant differences in the responses ($\chi 2$= 3.60, df= 3, p= 0.09). Sex of respondents did show a statistically significant differences in the categorized knowledge score ($\chi 2$=0.30 df=1 p=0.58). Marital status showed no statistically significant differences ($\chi 2$=0.301, df of 2, p= 0.81) with married category having the highest acceptable categorized knowledge scores 159(75%) followed by single category 123(72.8%).Occupation of respondents showed no statistically significant differences ($\chi 2$= 4.597, df=3, p=0.20). The unemployed had higher acceptable knowledge scores 74(79.6%) than other occupational category. Those who had primary and tertiary education had higher acceptable scores 66(72.7%) and

189(75%) respectively than respondents with non-formal and secondary education (Table 4.13)

**Table 4.10: Demographic Characteristics of Respondents**

| Characteristics No=400 | Total number of Respondents' | Specific rates (%) |
|---|---|---|
| **Gender** | | |
| Male | 254 | 63.5 |
| Female | 146 | 36.5 |
| **Age (years)** | | |
| <19 | 31 | 7.8 |
| 20-30 | 159 | 39.8 |
| 30-40 | 104 | 26.0 |
| >40 | 89 | 26.5 |
| **Marital Status** | | |
| Single | 169 | 42.3 |
| Married | 212 | 53.0 |
| Divorced | 18 | 4.5 |
| Widowed | 1 | 0.3 |
| **Occupation** | | |
| Commerce | 129 | 32.3 |
| Civil servant | 151 | 37.8 |
| Unemployed | 93 | 23.3 |
| Farmer | 27 | 6.8 |
| **Duration of Occupation** | | |
| 0-3 | 138 | 34.5 |
| 4-6 | 70 | 17.5 |
| 7-9 | 77 | 19.3 |
| >10 | 115 | 28.8 |
| **Educational level** | | |
| Non formal | 18 | 4.5 |
| Primary | 22 | 5.5 |
| Secondary | 108 | 27.0 |
| Tertiary | 252 | 63.0 |
| **Religion** | | |
| Christian | 276 | 69.0 |
| Muslim | 122 | 30.5 |
| Others | 2 | 0.5 |
| **Dog ownership** | | |
| Yes | 196 | 49.0 |
| No | 204 | 51.0 |
| **Have you been bitten by a dog** | | |
| Yes | 115 | 28.8 |
| No | 285 | 71.3 |

**Table 4.11: Responses of Respondents on Knowledge towards Rabies in Lokoja**

| Knowledge Item | Frequency (%) | $\chi 2$ | *df* | p-value |
|---|---|---|---|---|
| **Rabies cannot kill** | | | | |
| Yes | 131 (32.8) | 170.195 | 2 | 0.000 |
| No | 241 (60.3) | | | |
| Undecided | 28 (7.0) | | | |
| **Organisms that causes rabies affects the nerves** | | | | |
| Yes | 310 (77.5) | 351.185 | 2 | 0.000 |
| No | 47 (11.8) | | | |
| Undecided | 43 (10.8) | | | |
| **Rabies does not exist in Nigeria** | | | | |
| Yes | 22(5.50) | 351.860 | 2 | 0.000 |
| No | 308(77.0) | | | |
| Undecided | 70(17.5) | | | |
| **All animals can be infected with rabies & transmit rabies** | | | | |
| Yes | 223(55.8) | 102.635 | 2 | 0.000 |
| No | 117(29.3) | | | |
| Undecided | 60(15.0) | | | |
| **Dogs are common source of rabies in Nigeria** | | | | |
| Yes | 310(77.5) | 366.485 | 2 | 0.000 |
| No | 77(19.3) | | | |
| Undecided | 13(3.3) | | | |
| **Excessive foamy salivation and tendency to bite anything are not signs of rabies in dogs** | | | | |
| Yes | 142 (35.5) | 38.345 | 2 | 0.000 |
| No | 179 (44.8) | | | |
| Undecided | 79 (19.8) | | | |
| **Bites from an infected animal cannot spread Rabies to another animal** | | | | |
| Yes | 69(17.3) | 267.995 | 2 | 0.000 |
| No | 287(71.8) | | | |
| Undecided | 44(11.0) | | | |
| **Rabies is spread through the saliva of Dogs** | | | | |
| Yes | 279(69.8) | 238.805 | 2 | 0.000 |
| No | 58(14.5) | | | |
| Undecided | 63(15.8) | | | |
| **I know that it is against the law not to vaccinate my dogs** | | | | |
| Yes | 273 (68.3) | 224.045 | 2 | 0.000 |
| No | 81 (20.3) | | | |
| Undecided | 46 (11.5) | | | |
| **Dog registration and licensing cannot help in the control of rabies** | | | | |

| | | | | |
|---|---|---|---|---|
| Yes | 175 (43.8) | 25.835 | 2 | 0.000 |
| No | 133 (33.3) | | | |
| Undecided | 92 (23) | | | |

**Table 4.12: Association of Demographic Variables with Categorised Knowledge Scores of Respondents in Lokoja**

| | Categorised scores | | | |
|---|---|---|---|---|
| | Very good | Good | Fair | Poor |
| **Age (years)** | | | | |
| >19 | 4(12.9) | 13(41.9) | 13(41.9) | 1(3.2) |
| 20-30 | 24(15.1) | 98(61.6) | 35(22.0) | 2(1.3) |
| 31-40 | 14(13.5) | 59(56.7) | 29(28.6) | 2(1.9) |
| >40 | 18(17.0) | 57(53.8) | 31(29.2) | 0(0.0) |
| **Sex** | | | | |
| Male | 39(15.4) | 146(57.5) | 66(26.0) | 3(1.2) |
| Female | 23(15.8) | 85(59.6) | 34(23.3) | 2(1.4) |
| **Marital status** | | | | |
| Single | 24(14.2) | 99(58.6) | 43(25.4) | 3(1.8) |
| Married | 37(17.5) | 122(57.5) | 52(24.5) | 1(0.5) |
| Divorced | 1(5.6) | 11(61.1) | 5(27.8) | 1(5.6) |
| **Occupation** | | | | |
| Commerce | 11(8.5) | 76(58.9) | 41(31.8) | 1(0.8) |
| Civil servant | 29(23.4) | 84(55.6) | 36(23.8) | 2(1.3) |
| Unemployed | 17(14.4) | 57(54.2) | 17(23.3) | 2(1.2) |
| Farmer | 5(18.5) | 16(28.5) | 6(22.2) | 0(0) |
| **Educational level** | | | | |
| Non formal | 2(11.1) | 10(55.6) | 6(33.3) | 0(0) |
| Primary | 5(22.7) | 11(50) | 6(27.3) | 0(0) |
| Secondary | 13(12) | 65(60.2) | 27(25.0) | 3(2.8) |
| Tertiary | 42(16.7) | 147(58.3) | 61(24.23) | 2(0.8) |

**Table 4.13: Summary of Demographic Variables with Categorised Knowledge Scores of Respondents in Lokoja**

| | Unacceptable | Acceptable | $\chi 2$ | *df* | p-value |
|---|---|---|---|---|---|
| Age (years) | | | | | |
| <19 | 14(45.2) | 17(54.8) | 6.495 | 3 | 0.09 |
| 20-30 | 37(23.3) | 122(76.7) | | | |
| 31-40 | 31(29.8) | 73(69.5) | | | |
| >40 | 31(29.2) | 75(70.8) | | | |
| **Sex** | | | | | |
| Male | 69(27.2) | 185(72.8) | 0.301 | 1 | 0.585 |
| Female | 36(24.7) | 110(75.3) | | | |
| **Marital status** | | | | | |
| Single | 46(27.2) | 123(72.8) | 0.301 | 2 | 0.814 |
| Married | 53(25.0) | 159(75.0) | | | |
| Divorced | 6(33.3) | 13(66.7) | | | |
| **Occupation** | | | | | |
| Commerce | 42(32.6) | 87(67.4) | 4.597 | 3 | 0.204 |
| Civil servant | 38(25.2) | 113(74.8) | | | |
| Unemployed | 19(20.4) | 74(79.6) | | | |
| Farmer | 6 (22.2) | 21(77.8) | | | |
| **Educational level** | | | | | |
| Non formal | 6(33.3) | 12(66.7) | 0.812 | 3 | 0.847 |
| Primary | 6(27.3) | 66(72.7) | | | |
| Secondary | 30(27.8) | 78(72.2) | | | |
| Tertiary | 63(25.0) | 189(75.0) | | | |

### 4.4.3 Attitude of respondent towards rabies

The majority of respondents 302(75.5%) accepted that it is not good to allow stray dogs to roam freely into their compound while 75(18.8%) did not accept and 23(5.8%) were undecided. There was a statistically significant difference ($\chi 2$= 330.945, df =2, P= 0.000) in the responses. In this study, 167(41.8%) responded that the dog that bites someone should be caught and killed while 202(50.5%) disagreed and 31(7.8%) were undecided. Most of the respondents 365 (91.3%) were in favour of going to hospital if bitten by a dog, 29(7.3%) disagreed and 6(1.5%) were undecided. The respondents who said it was not good to nurse an unknown sick dog were 220(55%) and 122(30.5%) disagreed. Majority of the respondents 279(69.8%) disagreed that it is good to let dogs roam to get food because it makes them stronger. Majority of the respondents 340(85%) reported that they did not play with unknown dogs and most of them 321(85%) affirmed that keeping dogs not vaccinated against rabies was dangerous and should be avoided. Only 46(11.5%) of the respondents agreed that children should be allowed to play with dogs. (Table 4.14).

The responses of categorized attitude scores with demographic variables characteristics of respondents are shown in Table 4.16. There is no statistically significant difference between age categories ($\chi 2$=6.641 df=3 p=0.08). However, respondents aged between >40 years had higher acceptable attitude scores 84(94.4%). Similarly, males had significantly higher acceptable attitude scores 288(89.8%) than females 131(89.7%). Married respondent also showed significantly higher attitude scores 199(93%) than singles 143(84.6%) and divorced 16(88.9%). Occupational characteristics revealed high acceptable attitude scores among civil servants 140(92.7%). Educational level of respondents showed that respondents with secondary and tertiary education had higher acceptable attitude scores 96(88.9%) and 231(91.7)

respectively than other educational categories. Those that own dogs have a higher acceptable score 183(93.4) than those without dogs 176(86.3). (Table 4.16).

**Table 4.14: The Responses of Respondents on Attitude towards Rabies in Lokoja**

| Attitude item | Frequency | $\chi 2$ | df | p-value |
|---|---|---|---|---|
| **I do not allow stray dogs roam freely into my compound** | | | | |
| Yes | 302 (75.5) | 330.185 | 2 | 0.000 |
| No | 75 (18.8) | | | |
| Undecided | 23 (5.8) | | | |
| **A dog that bites someone should be caught and killed** | | | | |
| Yes | 167 (41.8) | 122.405 | 2 | 0.000 |
| No | 202 (50.5) | | | |
| Undecided | 31 (7.8) | | | |
| **It is not good to nurse an unknown sick dog** | | | | |
| Yes | 220 (55) | 99.860 | 2 | 0.000 |
| No | 122 (30.5) | | | |
| Undecided | 58 (14.5) | | | |
| **If I am bitten by a dog I will go to the hospital** | | | | |
| Yes | 365(91.3) | 605.765 | 2 | 0.000 |
| No | 29 (7.3) | | | |
| Undecided | 6 (1.5) | | | |
| **It is good to let dogs roam to get food because it makes them stronger** | | | | |
| Agree | 46 (11.5) | 241.865) | 2 | 0.000 |
| Dis agree | 279 (69.8) | | | |
| Undecided | 75 (18.8) | | | |
| **It is inhuman to confine your dog** | | | | |
| Agree | 76 (19.0) | 199.220 | 2 | 0.000 |
| Disagree | 266 (66.5) | | | |
| Undecided | 58 (14.5) | | | |
| **I do not play with unknown dogs** | | | | |
| Agree | 340 (85) | 480.515 | 2 | 0.000 |
| Disagree | 29 (7.3) | | | |
| Undecided | 31 (7.8) | | | |
| **Keeping dogs unvaccinated against rabies is dangerous and should be avoided** | | | | |
| Agree | 321(80.3) | 397.565 | 2 | 0.000 |
| Disagree | 30(7.5) | | | |
| Undecided | 49(12.3) | | | |
| **Children should be allowed to play with dogs** | | | | |
| Agree | 46 (11.5) | 355.145 | 2 | 0.000 |
| Disagree | 311 (77.8) | | | |
| Undecided | 43 (10.8) | | | |

**Table 4.15: Distribution of Categorised Scores by Demographic Variables**

| | Categorized scores | | | |
|---|---|---|---|---|
| | Very Good | Good | Fair | Poor |
| **Age (years)** | | | | |
| <19 | 27(57.4) | 11(23.4) | 7(14.9) | 2(4.3) |
| 20-30 | 93(58.5) | 49(30.8) | 16(10.1) | 1(0.6) |
| 31-40 | 65(61.9) | 30(28.6) | 9(8.6) | 1(1.1) |
| >40 | 54(60.7) | 22(22.7) | 12(13.5) | 0(0) |
| **Sex** | | | | |
| Male | 141(55.5) | 82(32.3) | 28(11) | 3(1.2) |
| Female | 98(67.1) | 30(20.5) | 16(11) | 2(1.4) |
| **Marital status** | | | | |
| Single | 94(55.6) | 52(30.8) | 20(11.8) | 3(1.8) |
| Married | 137(64.6) | 54(25.5) | 20(9.4) | 1(5.6) |
| Divorced | 8(44.4) | 6(33.3) | 3(16.7) | 0(0) |
| **Occupation** | | | | |
| Commerce | 76(58.9) | 37(28.7) | 14(10.9) | 2(1.6) |
| Civil servant | 94(62.3) | 43(28.5) | 13(8.6) | 1(0.7) |
| Unemployed | 58(62.4) | 24(25.8) | 10(10.8) | 1(1.1) |
| Farmer | 11(40.7) | 8(29.6) | 7(25.9) | 1(3.7) |
| **Educational level** | | | | |
| Non formal | 6(33.3) | 6(33.3) | 5(27.8) | 1(5.6) |
| Primary | 12(54.5) | 6(27.3) | 3(13.6) | 1(4.5) |
| Secondary | 64(59.3) | 31(28.7) | 12(11.1) | 1(0.9) |
| Tertiary | 157(62.3) | 69(27.4) | 24(9.5) | 2(0.8) |
| Dog ownership | | | | |
| Yes | 132(67.3) | 47(24) | 17(8.7) | 0(.0) |
| No | 107(52.5) | 65(31.9) | 27(13.2) | 5(2.5) |

**Table 4.16: Association of Demographic Variables with Categorized Attitude Scores of Respondents In Lokoja.**

| | Acceptable | Unacceptable | $\chi 2$ | df | p- value |
|---|---|---|---|---|---|
| **Age (years)** | | | | | |
| <19 | 38(80.9) | 9(19.1) | 6.641 | 3 | 0.084 |
| 20-30 | 141(88.7) | 18(11.3) | | | |
| 31-40 | 96(91.4) | 9(8.6) | | | |
| >40 | 84(94.4) | 5(5.6) | | | |
| **Sex** | | | | | |
| Male | 228(89.8) | 26(10.2) | 0.00 | 1 | 0.990 |
| Female | 131(89.7) | 15(10.3) | | | |
| **Marital status** | | | | | |
| Single | 143(84.6) | 26(15.4) | 8.880 | 3 | 0.031 |
| Married | 199(93.9) | 13(6.1) | | | |
| Divorced | 16(88.9) | 2(11.6) | | | |
| Widowed | 1(100) | 0(0) | | | |
| **Occupation** | | | | | |
| Commerce | 114(88.4) | 15(11.6) | 3.352 | 3 | 0.340 |
| Civil servant | 140(92.7) | 11(7.3) | | | |
| Unemployed | 80(86.0) | 13(14.0) | | | |
| Farmer | 25(92.6) | 2(7.4) | | | |
| **Educational level** | | | | | |
| Non formal | 15(83.3) | 3(16.7) | 5.622 | 3 | 0.131 |
| Primary | 17(77.3) | 5(22.7) | | | |
| Secondary | 96(88.9) | 12(11.1) | | | |
| Tertiary | 231(91.7) | 21(8.3) | | | |
| Dog ownership | | | | | |
| Yes | 183(93.4) | 13(6.6) | 5.466 | 1 | 0.19 |
| No | 176(86.3) | 28(13.7) | | | |

### 4.4.4 Practice of respondents towards rabies

Majority of the respondents 247(61.8%) indicated that it is good to keep dogs, that it was good to vaccinate dogs against rabies 372(93.0%). Respondents who said that it was good to wash dog bite wounds with soap and water were 245(61.3%). Most respondents agreed that it was good to have a cage for a dog 352(88%). However 149(37.3%) responded that it was not a good practice to castrate/spay dogs while 119 (29.8%) disagreed. Although most respondents 366(91.7%) agreed to see to treatment of victims of dog bite, some of them 127(31.8%) opted to take victim to a chemist for treatment while 43(10.8%) of the respondents were likely to use traditional herbs. Fifty five percent of the respondents preferred taking a dog bite victim to a veterinary clinic 220(55%). Also 363(95.8%) considered the option of taking victim to seek therapy from a hospital. (Table 4.17).

The results of categorized practice score with demographic variables were assessed (Table 4.19). Respondents above 40 years of age had higher acceptable practice scores 84(94.4%) than other age categories. There were no statistically significant differences ($\chi 2$= 6.641, df=3, p= 0.84). Male had higher knowledge score 228(89.8%) than female 131(89.7%) while married category had higher knowledge score 199(93.9%) than others. Sex and marital status of respondents showed statistically significant differences in categorized practice scores. However there was no statistically significant difference ($\chi 2$ =3.352, df= 3, p= 0.34) among occupational categories of respondents. Civil servants had higher acceptable practice scores 140(92.7%) than other occupational categories. Also those with tertiary education had 231 (91.7%) acceptable practice score, secondary education 96(88.9%), primary 17(77.3%) and non-formal 15(83.3%). There was no statistically significant differences ($\chi 2$ =5.622, df=3, p=0.132) among educational level of respondents. (Table 4.20).

**Table 4.17: The Responses of Respondents on Practice towards Rabies in Lokoja**

| Practice item | Frequency (%) | $\chi 2$ | *df* | p-value |
|---|---|---|---|---|
| **It is good to keep dogs** | | | | |
| Yes | 247 (61.8) | 175.055 | 2 | 0.000 |
| No | 121 (30.3) | | | |
| Undecided | 32 (8.0) | | | |
| **It is good to vaccinate your dog** | | | | |
| Yes | 372 (93.0) | 641.060 | 2 | 0.000 |
| No | 18 (4.5) | | | |
| Undecided | 10 (2.5) | | | |
| **It is good to wash dog bite wounds with soap** | | | | |
| Yes | 245 (61.3) | 146.585 | 2 | 0.000 |
| No | 57 (14.3) | | | |
| Undecided | 98 (24.5) | | | |
| **It is good to have a cage for your dog** | | | | |
| Yes | 352 (88) | 538.880 | 2 | 0.000 |
| No | 16 (4.0) | | | |
| Undecided | 32 (8) | | | |
| **It is not a good practice to castrate/spay dogs** | | | | |
| Yes | 149 (37.3) | 3.395 | 2 | 0.183 |
| No | 119(29.8) | | | |
| Undecided | 132(33) | | | |
| **How will you handle a victim of dog bite, Do nothing?** | | | | |
| Yes | 17 (4.3) | 609.005 | 2 | 0.000 |
| No | 366 (91.5) | | | |
| Undecided | 17 (4.3) | | | |
| **Take the victim to a chemist for treatment** | | | | |
| Yes | 127 (31.8) | 240.485 | 2 | 0.000 |
| No | 263 (65.8) | | | |
| Undecided | 10 (2.5) | | | |
| **Treat using traditional medicine (herbs)** | | | | |
| Yes | 43 (10.8) | 418.145 | 2 | 0.000 |
| No | 326 (81.5) | | | |
| Undecided | 31 (7.8) | | | |
| **Take the victim to a veterinary clinic** | | | | |
| Yes | 220 (55) | 105.035 | 2 | 0.000 |
| No | 127(31.8) | | | |
| Undecided | 53(13.3) | | | |
| **Take the victim to a hospital** | | | | |
| Yes | 376 (94) | 662.720 | 2 | 0.000 |
| No | 16 (4.0) | | | |
| Undecided | 8 (2.0) | | | |

N =400

**Table 4.18. Distribution of Categorised Practice Scores According To Demographic Variables of Respondents in Lokoja.**

| | Categorized scores | | | |
|---|---|---|---|---|
| | **Very Good** | **Good** | **Fair** | **Poor** |
| **Age (years)** | | | | |
| <19 | 19(40.4) | 19(40.4) | 7(14.9) | 2(4.3) |
| 20-30 | 68(42.8) | 73(45.9) | 15(9.4) | 3(1.9) |
| 31-40 | 55(52.4) | 41(39.0) | 8(7.6) | 1(1) |
| >40 | 52(58.4) | 32(36.0) | 4(4.5) | 1(1.1) |
| **Sex** | | | | |
| Male | 119(51.4) | 109(42.9) | 23(9.1) | 3(1.2) |
| Female | 75(51.4) | 56(38.4) | 11(7.5) | 4(2.7) |
| **Marital status** | | | | |
| Single | 65(38.5) | 78(46.2) | 24(14.2) | 2(1.2) |
| Married | 121(57.1) | 78(36.8) | 9(4.2) | 4(1.9) |
| Divorced | 8(44.4) | 8(44.4) | 1(5.6) | 1(5.6) |
| **Occupation** | | | | |
| Commerce | 50(38.8) | 64(49.6) | 12(9.3) | 3(2.3) |
| Civil servant | 90(59.6) | 50(33.1) | 7(4.6) | 4(2.6) |
| Unemployed | 41(44.1) | 39(41.9) | 13(14.0) | 0(0) |
| Farmer | 13(48.1) | 12(44.4) | 2(7.4) | 0(0) |
| **Educational level** | | | | |
| Non formal | 4(22.2) | 11(61.1) | 2(11.1) | 1(5.6) |
| Primary | 11(50) | 6(27.3) | 5(22.7) | 0(0) |
| Secondary | 52(48.1) | 44(40.7) | 9(8.3) | 3(2.8) |
| Tertiary | 127(50.4) | 104(41.3) | 18(7.1) | 3(1.2) |

*Number in front and percentages in parentheses*

**Table 4.19: Association between Demographic Variables and Practice Scores of Respondents in Lokoja**

| | Acceptable | Unacceptable | $\chi 2$ | *df* | p- value |
|---|---|---|---|---|---|
| **N=400** | | | | | |
| **Age (years)** | | | | | |
| <19 | 38(80.9) | 9(19.1) | 6.641 | 3 | 0.84 |
| 20-30 | 141(88.7) | 18(11.3) | | | |
| 31-40 | 91.4(91.8) | 9(8.6) | | | |
| >40 | 84(94.4) | 5(5.6%) | | | |
| **Sex** | | | | | |
| Male | 228(89.8) | 26(10.2) | 0.000 | 1 | 0.99 |
| Female | 131(89.7) | 15(10.3) | | | |
| **Marital status** | | | | | |
| Single | 143(84.6) | 26(15.4) | 8.880 | 3 | 0.31 |
| Married | 199(93.9) | 13(6.1) | | | |
| Divorced | 16(88.9) | 2(11.1) | | | |
| Widowed | 1(100) | 0 (0) | | | |
| **Occupation** | | | | | |
| Commerce | 114(88.4) | 15(11.60) | 3.352 | 3 | 0.340 |
| Civil servant | 140(92.7) | 11(7.3) | | | |
| Unemployed | 80(86.0) | 13(14) | | | |
| Farmer | 25(92.6) | 2(7.4) | | | |
| **Educational level** | | | | | |
| Non formal | 15(83.3) | 3(16.7) | 5.622 | 3 | 0.132 |
| Primary | 17(77.3) | 5(22.7) | | | |
| Secondary | 96(88.9) | 12(11.1) | | | |
| Tertiary | 231(91.7) | 21(8.3) | | | |

## 4.5. Detection of Rabies Antigen among Slaughtered Dogs by Direct Fluorescent Antibody (DFA) Technique

Out of the 208 dog heads tested for rabies antigen by direct fluorescent antibody technique, 151(75.2%) were males, while 57(37.9%) were females. The results showed that a total number of 11 samples (5.3%) were positive for rabies antigen. The rate of infection was same in males 8(5.3%) than in females 3(5.3%) [Table 4.19].

### 4.5.1. Distribution of dogs by sources

The results of the distribution of dogs by sources showed that out of 208 dogs tested, 29(13.9%) were sourced from Kogi, 83(39.9%) from Nassarawa, 96(46.1%) from Plateau, The highest number of positive samples 6(2.88%) were from Plateau while the remaining 3(1.44%) were from Nassarawa and Kogi 2(0.96%), (Table 4.20).

**Table 4.20: Sex And Age Distribution Of Dogs Slaughtered For Human Consumption In Lokoja Whose Brain Tissue Samples Tested Positive For Rabies Antigen.**

| Gender | % No positive | No. tested | Sex Specific rates |
|---|---|---|---|
| Male | 8/151 | 151(72.5) | 8(5.3) |
| Female | 3/57 | 57(37.9) | 3(5.3) |
| **Total (%)** | **11/208** | **208(100)** | **11(5.3)** |

*Age* Number positive / Number tested*

**Table 4.21: Distribution of Dog Brain Tissue Samples by Source of Dogs Slaughtered In Lokoja**

| Source | No. examined (%) | No. positive (%) |
|---|---|---|
| 1. Kogi | 29(13.9) | 2(0.96) |
| 2. Nassarawa | 83(39.9) | 3(1.44) |
| 3. Plateau | 96(46.1) | 6(2.88) |
| Total | 208(100) | 11(5.28) |

# CHAPTER FIVE

# DISCUSSION

Information obtained from 207 households in Lokoja indicated 114 households kept dogs and 93 household did not. Seven hundred and seventy eight (778) dogs were counted on the streets, while in the compound survey 295 dogs were counted with male to female ratio of 1.6:1. The dog owning household have an average of 1.4 dogs per household, which is similar to a report from a study in Aba of an average dog per household of 1:5 (Gbeminiyi *et al*., 2014). In this study the human to dog ratio is 4.1:1 which is also in conformity with other finding such as 4:1 recorded in Makurdi Benue State (Omudu *et al*., 2010) but at variance with a study of dog population in urban and rural Lagos with a dog to human population ratio of 1:21 and 1:45 and 1: 1000 in Muslim dominated parts of Kaduna State (Ogboebulem *et al*., 1989). The dog to human ratio depends on the socio-cultural, economic, religious status and beliefs of the inhabitants of the different study areas. The direct street count result was much higher than the result obtained from questionnaire survey in this study. In operational terms, the result of the direct street count may be considered more valuable in that it was repeatable (Olugasa and Aiyedun, 2012). The observed difference might be attributable to poor response from residents in the survey. The estimated population of dogs in Lokoja is 47,265.

The vaccination profile showed that local dogs had higher vaccination coverage (43.7%) than exotic (31.8%) and crossed (25%) breeds of dogs at the clinics. This is because the population of local dogs is more predominant in the area compared to the exotic breeds which are more expensive to acquire and maintain. This observation, however, does not

differ from the results of previous studies by Awoyomi *et al*. (2007) that local breed stand a higher risk of being unvaccinated compared to exotic breeds. Dogs within the age range of 3-12 months had the highest vaccination coverage (51.3%) than older dogs of the age range >12-36 months (31.8%) and >36 months (17.1%). The high vaccination rate in these young dogs may not be unconnected with the frequent advice to dog owners to vaccinate their dogs from 3 months old and above. Theoretical and empirical studies have shown that inclusion of puppies in rabies vaccination campaigns is likely to result in substantial epidemiological and economic benefits (Cleaveland, 1996; Coleman, 1999). Dogs less than 6 months are significantly important in rabies transmission to humans (Mitmonnpitak et al., 1998) and more likely to be accessible for parenteral vaccination than older dogs. The sex of dogs may affect the vaccination coverage in the study area, as more males (57.6%) were vaccinated than females (42.4%). The increased number of male dogs being vaccinated could be as a result of male to female ratio dominance and due to the desire of many dog owners preference for male dogs for security because they believe they are more vicious.

In this study, there was high prevalence of dog bites among males 57 (60%) and individuals between 10-19 years 46 (48.4%). This may be due to the fact that people of this category have frequent contact with dogs resulting in the high rate of exposure to bites. This finding is in agreement with other reports (Owai, 2009., WHO, 2010., Lunney *et al.,* 2011) where children of less than 20 years were found to be the major victims and more vulnerable to dog bites. Other authors (Ahmed *et al.*, 2000; Hampson *et al.,* 2008; Abubakar and Bukari, 2012) had also reported higher bite frequencies among boys compared with girls. Defensive aggression is likely a major contributing factor to dog bites. This study found a high frequency of dog bites on the legs (48%)

and majority of the bite cases were associated with local breed of dogs which are predominantly found in the study area. The occurrence of dog bites mostly on the legs may be due to proximity of this part of the body to the animal. Also it is likely that victims would have used legs in an attempt to separate fighting dogs or defending themselves against dog attacks resulting in more bites on the lower extremities. Local dogs are in most cases not confined and so they roam freely. All of these factors may increase the rate of interaction between dogs and humans, hence the bites. In this study, seasonal variation in dog bites seemed to play a role in the epidemiology of rabies. The frequency of dog bites increased significantly during the dry season, from October to March. This finding agrees with the results of similar studies by Owai (2009), Umoh and Belino (1979) and Tomori (1980) who reported that most outbreaks of rabies occur in the dry season which coincides with the breeding season of dogs in most parts of Nigeria. The respondents showed awareness about the legal implications of non-vaccination/ registration of dogs and age of vaccination. This could be due to availability of information from previous campaigns either by veterinarians, animal health workers who visit dog owners for anti-rabies vaccination or from multiple sources including government campaigns and mass media.

Respondents aged 20 -30 years had significantly acceptable knowledge scores. This may not be unconnected with the fact that at this age most of them are students of tertiary institutions so they are more knowledgeable and they tend to have better understanding and awareness about the disease. The attitude of respondents not allowing stray dogs to roam freely into their compound, seeking medical treatment if bitten by a dog, not playing with unknown dogs or keeping unvaccinated dogs against rabies are good indicators of community involvement in the control of rabies since

people were constantly being motivated and reminded about the dangers of rabies in the society through awareness campaigns and personal contacts with dog handlers. The practice of seeking traditional therapy if bitten by a dog could however, be due to the traditional beliefs that dog bite wounds are better managed with herbs than the use of orthodox treatment. This poor practice of seeking traditional treatment negates WHO recommendation of instituting medical consultation for victims of dog bite. WHO recommends immediate and vigorous washing with soap and water after a dog bite, followed by application of 70% ethanol or tincture of iodine (Matibag *et al.*, 2009). Respondents above 40 years, civil servants and those with secondary or tertiary education showed acceptable practices against rabies, possibly due to western education and are aware about the danger of the disease. This could explain why a significant number (75.5%) of the respondents do not allow stray dogs to roam freely into their premises. Allowing stray dogs to roam about is one of the risk factors contributing to the spread of rabies in the animal population and could continue to make rabies a zoonotic threat to humans. Majority of the respondents answered affirmatively that it is good to wash dog bite wounds with soap and water which is in line with WHO recommendation as first aid treatment against dog bite.

The presence of rabies antigen in brain tissues of apparently healthy dogs slaughtered for human consumption is a significant factor in the epidemiology of the disease. The public health implication of this finding is that individuals involved in handling and processing of dog meat are at risk of exposure to rabies either from bites by these dogs before slaughter or from infected nervous tissues or saliva that may accidentally contaminate open wounds or bruises during processing of slaughtered dogs. This

finding is in agreement with previous studies from several locations in Northern Nigeria (Sabo, 2008; Akombo, 2009; Garba *et al.,* 2008; Aliyu *et al.,*

2010). This result also agrees with the findings of Baba (2006) and Aliyu *et al* (2010) which showed that more adult dogs tested positive for rabies antigen compared to puppies. Majority of the positive dogs 6(2.88%) were sourced from Plateau State which is a state close to the study area and where majority of the dogs are brought in from. The implication of this finding is that rabies could possibly be imported to Lokoja through dog trade from the other states. In an earlier study carried out by Akombo (2009) in Makurdi, Benue State, a prevalence of 15.8% was recorded in brain tissues of dogs slaughtered for human consumption.

# CHAPTER SIX

# SUMMARY, CONCLUSION AND RECOMMENDATIONS

## 6.1 Summary

This descriptive and cross sectional study was conducted to elucidate dog ecology, examine factors associated with dog bites on humans and vaccination of dogs by analysing records of dog bite and anti-rabies vaccination in two veterinary clinics in Lokoja the State Veterinary Clinic and Animal Friend Veterinary Clinic all in Lokoja . Also, to assess knowledge, attitude and practices associated with dog bite victims care seeking preferences among residents of Lokoja through structured questionnaire, check for the presence of rabies antigen in the brain tissues of dogs slaughtered for human consumption using the fluorescent antibody technique.

The study revealed that the estimated population of dogs in Lokoja was 47,265. One hundred and fourteen (114) households keep dogs and 93 household did not. Seven hundred and seventy eight (778) dogs were counted on the streets, while in the compound survey 295 dogs were counted with male to female ratio of 1.6:1. The dog owning household have an average of 1.4 dogs per household. In this study the human to dog ratio is 4.1:1. The study also found out that out of 94 human dog bite cases reported to the State Veterinary Hospital, Lokoja, 46(37.2%) were in persons between 10-19 years of age and the highest frequency (50.5%) of dog bites occurred on lower extremities. Dogs within the age of 3-12months received the highest vaccination (n

=688, 51.3%) against rabies. Association of demographic variables with categorized knowledge, attitude and practice scores of respondents revealed statistically significant differences (P< 0.05). Respondents 20-30 had highest acceptable (76.7%) scores. Also, civil servants and respondents with secondary and tertiary education had higher acceptable attitude and practices towards rabies than other occupational categories. Rabies antigen was detected in 11 samples (5.3%) out of 208 brain tissue samples examined by fluorescent antibody technique. Some risk factors such as not wearing protective coverings and receiving pre- and post-exposure prophylaxis were identified among dog meat processors and consumers in the study area. There is high public health risk of rabies exposure to processors and consumers of dog meat and requires strategic intervention.

## 6.2 Conclusion

In this study, the following was observed.

1. In the street count the total number of dogs counted were 778 and in a ratio of male: female 1.33:1.While in the house survey a total of 295 dogs were counted with a ratio of 1.6:1.The survey was able to determine an average of 1.5 dogs per household survey with an estimated dog population of 47,265.
2. Vaccination profile of dogs showed high vaccination coverage (43.7%) in local breed of dogs, (57.7%) male and (51.3%) young dogs. However, there were no statistically significant differences among ages of dogs' vaccinated.
3. It was observed that dog bite is a common problem and the distribution is higher among males than females. Individuals between 10-19 years were mostly affected. Bite wounds occurred on the lower extremities (legs) than other parts of the body. Local breed of dogs are mostly incriminated in the bites

4. In this study, respondents showed inadequate knowledge about rabies and its public health consequences. The general attitude and practice of respondents towards rabies management, control and prevention is not satisfactory as majority of the respondents still prefer traditional therapy if bitten by a dog. They do not wear protective clothing during processing and handling of dogs; neither do they receive pre or post exposure prophylaxis against rabies. This negative practice not only negates WHO guidelines for the control and prevention of rabies but could easily expose them to the disease. The practice towards rabies was significantly affected by educational status, age and occupational characteristics of respondents.
5. The detection of rabies antigen in the brain tissues of dogs slaughtered for human consumption (5.3%) indicates the occurrence of rabies virus and is a significant factor in the transmission and spread of rabies in the area. Risk factors such as not wearing protective coverings, lack of awareness of pre and post exposure prophylaxis of human anti- rabies vaccine, dog bites and exposure of cuts or wounds to brain tissues and saliva during processing of dog meat were observed among dog handlers during the study. All these factors could contribute to the epidemiology of rabies in the study area.

## 6.3 Recommendations

In this study, the following recommendations are made:

1) Further dog ecological studies involving both urban and rural areas of Kogi State be carried out.

2) The Kogi State Government as a matter of urgency through its ministries of Health and Agriculture should make it a law that the heads of all killed dogs should be

collected and transported to NVRI, Vom for rabies diagnosis with responsibility on logistics shouldered by the state government.

3) Rabies high risk individuals particularly the Veterinary personnel, surveillance officers, dog butchers in the state and Nigeria at large should be vaccinated and for rabies

4) Educational awareness of people about the risk of dog bites and rabies should be intensified.

Dog bite victims and dog handlers should be encouraged to receive post exposure treatment from qualified medical facilities instead of using traditional medicine to treat dog bite injuries.

5) Intensive mass vaccination campaign against rabies through public enlightenment campaign is imperative as a means of controlling the disease.

6) Intervention measures should include public health educational programs on dog behaviour, pre- and post-exposure prophylaxis, dog- child interaction, importance of responsible dog ownership and the danger of rabies.

7) Enforcement of leash laws and regulations for licensing of dogs, rabies vaccination and stray dogs population management are important for reducing bite incidents and post bite treatment cost, the law that prohibits free roaming of dogs on the street still needs to be actively propagated through campaigns on the media and in professional enforcement by animal health authorities.

8) The knowledge, attitude and practice on rabies could be further enhanced through the use of information and educational materials.

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## APPENDICES

## APPENDIX I

**DEPARTMENT OF PUBLIC HEALTH AND PREVENTIVE MEDICINE**
**FACULTY OF VETERINARY MEDICINE**
**AHMADU BELLO UNUIVERSITY, ZARIA**

**DOG ECOLOGY OF LOKOJA KOGI STATE**

**INSTRUCTION: Please carefully read and answer the following questions. The information obtained will be used strictly for academic purpose only and absolute confidentiality will be ensured. Thank you for your time spared. Tick () the box provided accordingly**

### SECTION A: BIODEMOGRAPHIC INFORMATION OF RESPONDENT

1) NAME_____-

2) LOCATION_____

3) AGE(Years) : a, < 19 [ ] b, 20 - 30 [ ] c, 30 - 40 [ ] d, <40

4) SEX a, Male [ ] b, Female [ ]

5) MARITAL STATUS: a, Single [ ] b, Married [ ] c, Divorced [ ] d, Widowed [ ]

6) OCCUPATION a, Business [ ] b, Civil servant [ ] c. unemployed [ ]

d, Farmer [ ]

7) DURATION a, 0 – 3 [ } b, 4 – 6 [ ] c, 7 – 9 [ ] d, >10 [ ]

8) LEVEL OF EDUCATION: a, No formal education [ ] b. Primary [ ] c, Secondary [ ] d, Tertiary [ ]

9) NUMBER OF CHILDREN: a, None [ ] b, 1 [ ] c, 2 [ ] d, 3 [ ] e >3 [ ]

10) RELIGION: a, Christian [ ] b, Islam [ ] c, Others [ ]

11) DO YOU OWN DOGS: a, Yes [ ] b, No [ ]

12) SEX OF YOUR DOG: a, Male [ ] b, Female [ ]

13) NUMBER OF DOGS OWNED :

14) BREED OF DOG: a, Indigenous [ ] b, Exotic [ ] c, Cross [ ]

15) WHAT IS THE USE OF YOUR DOG: a, Security [ ] b, Pet [ ] c, Hunting [ ] d, Herding [ ]

**SECTION B: MANAGEMENT**

16) ARE YOUR DOGS CONFINED? a, Never [ ] b, Partial [ ] c, Always [ ] d, Unknown

17) WHO PROVIDES CARE FOR THE DOG: a, Father [ ] b, Mother [ ] c, Children [ ] d Everybody [ ]

18) HOW ARE YOUR DOGS FED? a, Family leftover [ ] b, Cook [ ] c, Commercial [ ]

19) WHAT IS THE CAUSE OF DOG DEPOPULATION: a, Giving away [ ] b, Disappear [ ] c, intentional killing [ ] d, Auto accident [ ] e, Death due to disease [ ]

**SECTION C: VACCINATION**

20) HAVE YOU VACCINATED YOUR DOG AGAINST RABIES? a, Yes [ ] b, No [ ] c, Unknown [ ]

21) WHERE DO YOU VACCINATE YOUR DOGS? a, State Veterinary Clinic [ ] b, Private Veterinary Clinic [ ] c, Home [ ]

22) WHAT DOCUMENT DO YOU HAVE AS EVIDENCE OF VACCINATION: a, Pet green book [ ] b, Rabies certificate [ ] c, Oral declaration [ ]

**SECTION D: KNOWLEDGE OF CASES OF DOG BITES, MANAGEMENT AND CONSEQUENCES**

23) HAVE ANY OF YOUR FAMILY MEMBER EVER BEEN BITTEN BY A DOG: a, Yes [ ] b, No [ ]

24) WHO IS THE OWNER OF THE OFFENDING DOG: a Household [ ] b, Neighbour [ ] c, Stray [ ]

25) WHAT HAPPENED TO THE DOG? a, Died [ ] b, Killed [ ] c, Healthy [ ] d, Unknown [ ]

26) WHAT TREATMENT WAS GIVEN TO THE VICTM: a, Anti rabies post exposure prophylaxis [ ] b, Local wound treatment using antibiotics [ ] c, Traditional (herbal) dog bite treatment [ ] d, None [ ]

27) WHAT HAPPENED TO THE VICTIM: a, Healthy [ ] b, Died [ ] c, Unknown

28) IF THE VICTIM DIED WAS THERE ANY ABNORMAL BEHAVIOUR? : a, Yes [ ] b, No

## APPENDIX II

**DEPARTMENT OF PUBLIC HEALTH AND PREVENTIVE MEDICINE**
**FACULTY OF VETERINARY MEDICINE**
**AHMADU BELLO UNIVERSITY, ZARIA**

**KNOWLEDGE, ATTITUDE AND PRACTICE SURVEY OF RESIDENTS OF LOKOJA TOWARDS RABIES**

**INSTRUCTION:** Please kindly read and answer the following questions. The information obtained will be used strictly for academic purpose only and absolute confidentiality will be ensured. Thank you for your time spared. Tick (√) the box provided accordingly.

**SECTION A: BIODEMOGRAPHIC INFORMATION OF RESPONDENT**.

1. Name: _____

2. Location: _____

3. Age (years): a. <19[ ] b. 20-30[ ] c. 31-40[ ] d. >40[ ]

4. Sex: a. Male [ ] b. Female [ ]

5. Marital status: a. single [ ] b. married [ ] c. divorced [ ] d. widowed [ ]

6. What is your occupation? a. businessman/woman[ ] b. civil servant[ ] c. Unemployed[ ] d. farmer[ ]

7. Duration in business/ service/ practice/ farming a.0-3[ ] b.4-6[ ] c.7-9[ ] d. > 10[] years

8. Level of education: a. no formal education [ ] b. primary [ ] c. secondary [ ] d. tertiary [ ]

9. Number of children: a. none [ ] b. 1[ ] c. 2[ ] d. 3[ ] e. >3[ ]

10. What is your religion: a. Christian [ ] b. Islam [ ] c. others [ ]

11. Do you own dogs; a yes [ ] no [ ]

12. Number of dogs owned: a. none [ ] b. 1[ ] c. 2[ ] d. 3[ ] e. >3[ ]

13. Have you been bitten by a dog before? a, yes[ ] b. no[ ]

**SECTION B: KNOWLEDGE**

14. Rabies cannot kill a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

15. The organism that causes rabies affects the nerves a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

16. Rabies does not exist in Nigeria a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

17. All animals can be infected with and can transmit rabies virus a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

18. Dogs are possible common source of rabies virus in Nigeria a. Agree [ ] b. Disagree [ ] c . Undecided [ ]

19. All humans can be infected with rabies a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

20. Bites from an infected animal cannot spread rabies organism to another animal a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

21. Rabies is spread through saliva of a rabid animal a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

22. The age of first vaccination of dogs is 3 months a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

23. An infected human can transmit rabies to another human through contact a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

24. Dog bites increases your chances of getting rabies a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

25. A friendly dog that suddenly turns aggressive may have rabies a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

26. Excessive foamy salivation and tendency to bite anything are not signs of rabies in dogs. a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

27. It is against the law not to vaccinate my dog(s) against rabies a. Agree [ ] b. Disagree [] c. Undecided [ ]

28. Will you present your rabies vaccination certificate on request? a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

29. Dog registration and licensing cannot help in the control of rabies a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

30. Vaccination of dogs against rabies should be repeated yearly a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

**SECTION C: ATTITUDE**

31. I do not allow stray dogs roam freely into my compound a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

32. A dog that bites someone should be caught and killed a. Agree [ ] b. Disagree [ ] c. Undecided []

33. It is not good to nurse an unknown sick dog a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

34. If I am bitten by a dog, I will go to the hospital a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

35. It is good to let dogs roam to get food because it makes them grow stronger a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

36. It is inhumane/bad to confine your dog(s) a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

37. It is good not play with unknown dogs a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

38. Keeping dogs that are not vaccinated against rabies is dangerous and should be avoided

a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

39. Children should be allowed to play with dogs? a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

**SECTION D: PRACTICE**

40. It is good to keep dog(s)? a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

41. Is it good to vaccinate your dog(s)? a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

42. It is good to wash dog bite wounds with soap a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

43. It is good to have a cage for your dog(s)? a. Agree [ ] b. Disagree [ ] c. Undecided []

44. It is not a good practice to castrate/spay dogs? a. Agree [ ] b. Disagree [ ] c. Undecided [ ]

. If a person is bitten by a dog what should be done

45. Do nothing a. Agree [ ] b. Disagree [ ] c. Undecided []

46. Take the victim to a chemist for treatment a. Agree [ ] b. Disagree [ ] c. Undecided

47. Treat using traditional medicine (herbs etc) a. Agree [ ] b. Disagree [ ] c. Undecided

48. Take the victim to a Veterinary clinic a. Agree [ ] b. Disagree [ ] c. Undecided []

49. Take the victim to a hospital a. Agree [ ] b. Disagree [] c. Undecided []

## APPENDIX III

**STREET DOG CENSUS DATA IN LOKOJA**

**AREA**_____

**COUNTED BY**_____

| Street | Local | Exotic | Crosses | 1-24months | >24 months | Males | Females |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
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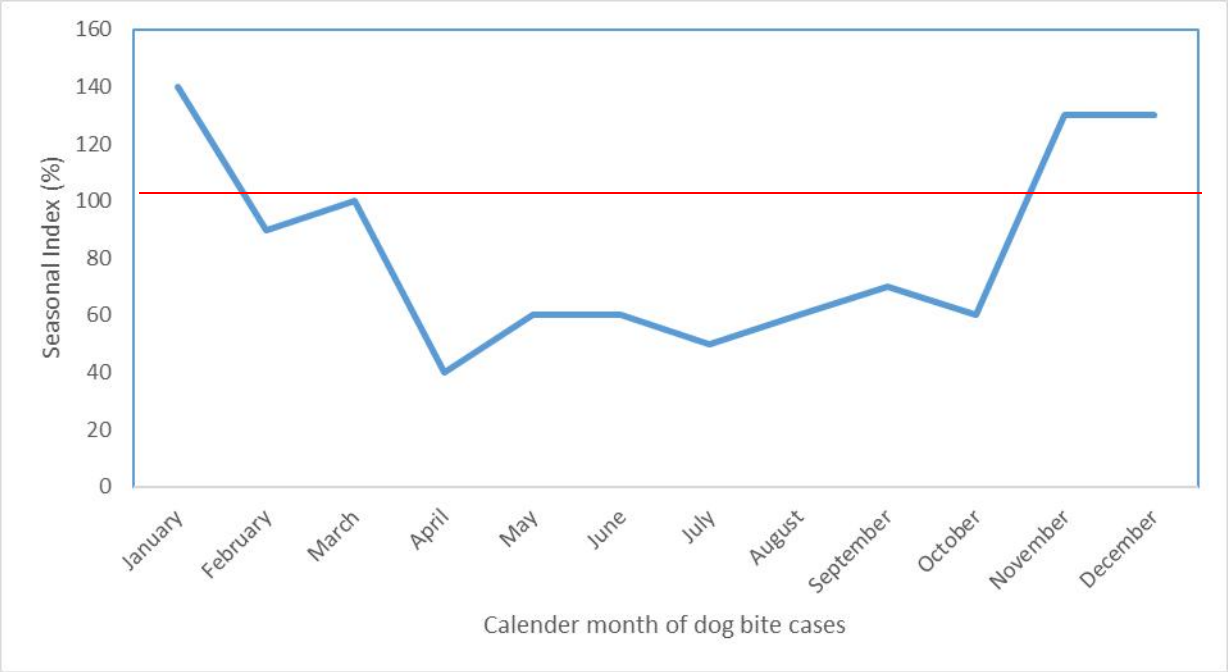


Fig 4.4: Seasonal index of dog bites cases in Humans in Lokoja