



Awareness and Compliance with Anti-Rabies Vaccine for Cats: A public health challenge in Nigeria

Ogundeji Ebenezer Bukola^{1*}, Onyemelukwe Ngozi Felicia², Ishaya Sinni Tekki³, Ogundeji Alice Oluwapelumi⁴, Zhakom Ponfa Nden³, Ajayi Olawunmi Toyin⁵, Onuoha Macdonald Nwabueze⁶, Eze Kanayo Ann² and Livinus Clement Jona³

¹Virology Department, National Veterinary Research Institute P.M.B 01 Vom, Plateau State, Nigeria; ²Medical Laboratory Science Department, Faculty of Health Science, University of Nigeria Nsukka, Enugu State, Nigeria; ³Rabies diagnosis department, National Veterinary Research Institute P.M.B 01 Vom, Plateau State Nigeria; ⁴Central Diagnosis Department, National Veterinary Research Institute P.M.B 01 Vom, Plateau State Nigeria, ⁵Bacteriology department, National Veterinary Research Institute P.M.B 01 Vom, Plateau State, Nigeria; and ⁶University of Maiduguri Teaching Hospital, Nigeria

*Corresponding author: Ogundeji Ebenezer Bukola. Email: ebenezergundeji@gmail.com

Abstract

BACKGROUND

Rabies is a zoonotic disease of viral origin. It is viral encephalitis which can easily be transmitted from one infected animal to another and from an infected animal through its saliva to man by biting.

MATERIALS AND METHOD

The study was carried out in 3 major local Government areas of Plateau State of Nigeria namely; Jos North, Jos South and Qua'anpan. Plateau State is located in the North Central geo-political zone of Nigeria with over three million human populations (> 3,000,000) good weather and ideal environments. These three local Government areas constitute the major area and land mass of Jos city and Qua'anpan of Plateau State. This descriptive study aimed to evaluate the level of awareness and compliance to anti-rabies vaccination by cat owners in these endemic areas. A total of 360 questionnaires were distributed among three selected local Government areas to those that rear cats after a brief orientation about the study. Quantitative data obtained from the primary were analysed using Graphpad prism 9.1.

RESULT

The questionnaires filled and recovered from the subjects were 93, 97 and 100 from Jos North, Qua'anpan and Jos South Local Government areas respectively making the total number 290 questionnaires. Only 47(16.2%) out of 290 subjects are aware that cats need to be vaccinated against rabies while 243(83.8%) were not aware (95% CI=2.919 to 28.41, t=5.288, d=2) (P < 0.05). some are aware but they did not complied 14 (4.8%) (CI= -27.46 to 14.79, t=1.290, df = 2, P>0.05). 23(7.9%) vaccinated their cats once and failed to give booster dose (CI =-23.23 to 13.23, t=0.6712, df=6) (P>0.05). Cat management system, confined = 17(5.86%), roaming = 273 (94.14%). (t=2.802, df=6, p<0.05). Causes of death; sickness = 61(21.1%), accident=48(16.6%). Nature of sickness; aggressiveness=5(1.7%), weakness= 17(5.9%), salivation=1(0.3%), paralysis =16(5.5%), emaciated =21(7.2%), others =1(0.3%). Disposal of carcass; consumed =3(1.0%), Buried =25(8.6%), discarded = 81(27.9%).



CONCLUSION

Awareness and compliance with the anti-rabies vaccine for cats are very low and this is a serious threat to public health.

Keywords: Rabies, Virus, Vaccine, Cat, zoonotic

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Introduction

Rabies is a zoonotic disease of viral origin. It is an acute infection and can cause disease in a variety of domestic and wild animals and bats ⁽¹⁾. It is viral encephalitis which can easily be transmitted from one infected animal to another and from an infected animal through its saliva to man by biting ⁽²⁾

Rabies as a disease is caused by the rabies virus. The virus belongs to the *Lyssavirus* Genus and *Rhabdoviridea* family ⁽³⁾. Rabies virus is an envelope, cylindrical or bullet-shaped virus that contains a negative sensed RNA which makes up its genetic materials ⁽⁴⁾.

The World Health Organization (WHO) ranked animal rabies as the 12th on their list of deadly infectious and parasitic diseases ⁽⁵⁾ while in 2000, it was rated the 11th cause of human death due to infection ⁽⁶⁾.

In the developed countries of Asia, Africa and Latin America, 98% of human rabies has been reported to be caused by an animal bite. ⁽⁷⁾ Outbreaks of rabies have been reported accurately by some developed countries but not so in Nigeria; thereby the status of rabies remains unknown thus rabies in animals and humans is underreported ⁽⁸⁾.

In the United States of America, the cat is the most common domestic animal found to be rabid and thereby causing a higher percentage of rabies infection due to her level of cohabitation with humans ⁽⁹⁾. According to Rupprecht and Tumphey, 2007, canine rabies is no longer a threat in the United State of America ⁽¹⁰⁾. A Centers for Disease Control (CDC) report on the U.S shows that in 2014, reported cases of rabies in cats were four times more than those

reported in dogs ⁽¹¹⁾. The concern here is that most cat owners do not take their pets for veterinary attention to vaccinate them against rabies. The American Veterinary Medical Association (AVMA) in the U.S reported that only 55% of cat owners took their pets to veterinary in 2011, which is a decrease when compared with 64% in 2006. This is much less when compared with the rate (81% in 2011 and 83% in 2006) at which dog owners visit the veterinary clinic with their dogs for vaccination.

According to the report of Zienius *et al.*, 2003, 2277 cases of rabies were recorded among wild and domestic animals between the years 1990 to 2000 in all districts in Lithuania. Domestic animals accounted for 46%, while wild animals were responsible for 54% of the cases registered ⁽¹²⁾.

In 2006, Ali *et al.* carried out research on the epidemiology of rabies in Sudan and it was reported that rabies is endemic in Sudan with the continuous outbreak of disease after its first reported cases in 1904 ⁽¹³⁾. Canada reported a 7.7% decrease in rabies in domestic animals in 2006 compared to the previous years. Meanwhile increase of 60% was reported in raccoons and bovine cases by 62.5%; cases in dogs, 8.3% while cases in cats, 50.0% in 2006 ⁽⁹⁾.

In most Asian countries, Canine rabies remains a big threat ⁽¹⁴⁾ ⁽¹⁵⁾. It has been documented that rabies is endemic in China and India even though its mode of transmission from one country to another is unclear ⁽¹⁶⁾, china and India have the highest rabies cases in the World ⁽¹⁷⁾.



Dogs have been identified as a major culprit in rabies transmission and are responsible for over 95% of human rabies cases reported in china and India⁽⁸⁾⁽¹⁸⁾. Government policies have been the major problem in controlling rabies in Asia and how to control dogs remain a major problem in most developing countries therefore emphasis has been on post-exposure treatment⁽¹⁴⁾⁽¹⁶⁾. Despite all measures put in place, rabies remains endemic in Asia⁽¹⁶⁾.

Most European countries have succeeded in the elimination of canine rabies but rabies in wildlife remains a big threat to them. Insectivorous bats are the main rabies vector in Chile but Canine rabies has been controlled⁽¹⁹⁾.

In Nigeria, different researches were carried out on brain samples collected from apparently healthy dogs, the results of which show prevalence rates of between 28-32%⁽²⁰⁾⁽²¹⁾⁽²²⁾. Recently, in Nigeria, precisely at Mokola and Lagos, a serological analysis was carried out on bats, the result of which shows the presence of the virus antigen⁽²³⁾⁽²⁴⁾. This disease poses a public health risk in Nigeria seeing that even the healthy dogs that are been consumed by humans possess the viral antigen in their brains and saliva⁽²⁵⁾.

Rabies is endemic in Nigeria with dogs reported as the major reservoir⁽²⁶⁾⁽²⁷⁾. However, a few reports on cats have been documented from the records of the National Veterinary Research Institute, Vom making the role of cats in the epidemiology of the disease negligible⁽²⁵⁾⁽²⁶⁾ because the number of reported cases of rabies in cats is very low. Nevertheless, cats constitute the second most frequently affected animals after dogs⁽²⁶⁾.

The first documented case of rabies in a kitten was reported by Paul *et al.*, 2014, where the case was found in a one-month-old Kitten in South Eastern part of Nigeria. Humans cohabit more with cats than with other domestic animals, hence increasing their chances of

exposure to rabies from an infected cat, thus making the disease a great public health concern^{(28), (26)}. Presently, in Nigeria, there is no law guiding the rearing of cats and mandates the owner for vaccination as it is with dogs. Rabies is endemic in Nigeria with dogs reported as the major reservoir⁽²⁶⁾⁽²⁷⁾.

Hence there is a need to ascertain the level of awareness about anti-rabies vaccination by cat owners. This study aimed to evaluate the level of awareness and compliance to anti-rabies vaccination by cat owners in these endemic areas.

Materials and Methods

We used a descriptive study design. The subjects used in the study consist of only people that rear cats. The sample size was determined using the equation described by Naing⁽²⁹⁾.

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

Where;

‘N’ is the desired sample size,

‘Z’ is the standard normal distribution at 95% confidence interval = 1.96,

‘P’ is the known prevalence of the infection

‘d’ is the allowable error which is taken as 5% = 0.05

Using the above formula and the prevalence rate ‘P’ of 28%, from a previous study⁽²⁵⁾

$$\text{Therefore } N = \frac{1.96^2 \times 0.28 (1-0.28)}{0.05^2}$$

$$N = \frac{3.8416 \times 0.2016}{0.0025}$$

$$N = 309$$

Ethical clearance was obtained from the animal care and ethics committee of the National Veterinary Research Institute Vom, Plateau State, Nigeria. NVRI AEC REF NO: AEC/02/40/17.

The study was carried out in 3 major local Governments of Plateau State of Nigeria



namely; Jos North, Jos South and Qua'anpan. Plateau State is located in the North Central geopolitical zone of Nigeria with over three million human populations (> 3,000,000) good weather and ideal environments. These three local Government areas constitute the major area and land mass of Jos city and Qua'anpan of Plateau State.

A pre-validated questionnaire was used to carry out this descriptive survey. The questionnaire consists of 3 major segments; the first segment consists of the location and local Government of the subjects, the second parts consist of the owners' demographic, the third segment consists of the cat management system, awareness about anti-rabies vaccination for cats, level of compliance, death and causes of death of their cats. Questionnaires were shared at the marketplaces, churches, Mosques and Schools in the selected area to only those that reared cats after proper orientation and consented to

participate in the survey. The sample size was calculated to be 309 but the total number of 360 questionnaires was shared in the 3 local governments covered in this survey. Additional 51 questionnaires added were to cover for those respondents that may decline before the end of the survey.

Total numbers of 360 questionnaires were distributed among three selected local Governments in Plateau State namely; Jos North, Jos South and Qua'anpan. 120 questionnaires were given in markets and schools in each local Government to those that rear cats only after a brief orientation about the study.

Data collected were subjected to descriptive statistics and analysed using an independent t-test, paired t-test and Spearman's rank coefficient correlation. Graph pad prism 9.1 was used. The level of significance was set at $p < 0.05$.

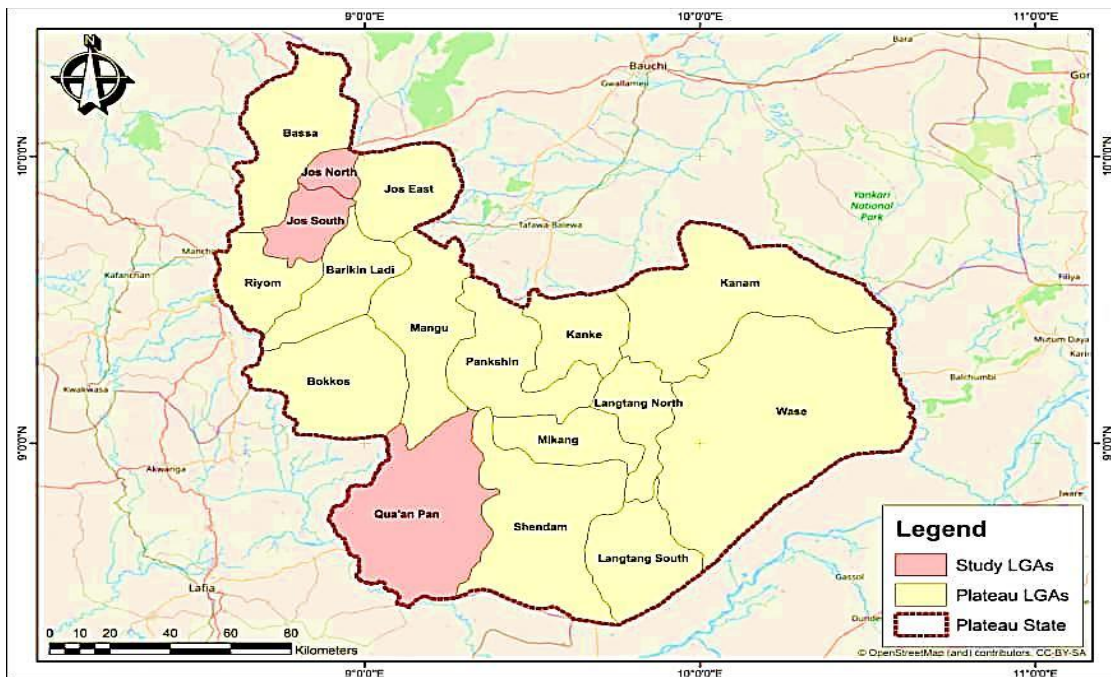


Figure 1:
Map of Plateau State indicating the study area



Result

The total number of a questionnaire filled and recovered from the subjects are 93, 97 and 100 from Jos North, Qua'anpan and Jos South Local Governments respectively making the total number of 290 questionnaires. Out of these

290, a total number of 219(75.5%) were keeping cats for domestic purposes, 58(20%) for hunting and 13(4.5%) were for business purposes. The majority of these cats owner are traders 132(45.5%) while some are civil servants 56(19.3%), farmers 37(12.8%) and others (those with hand work and students) (22.4%).

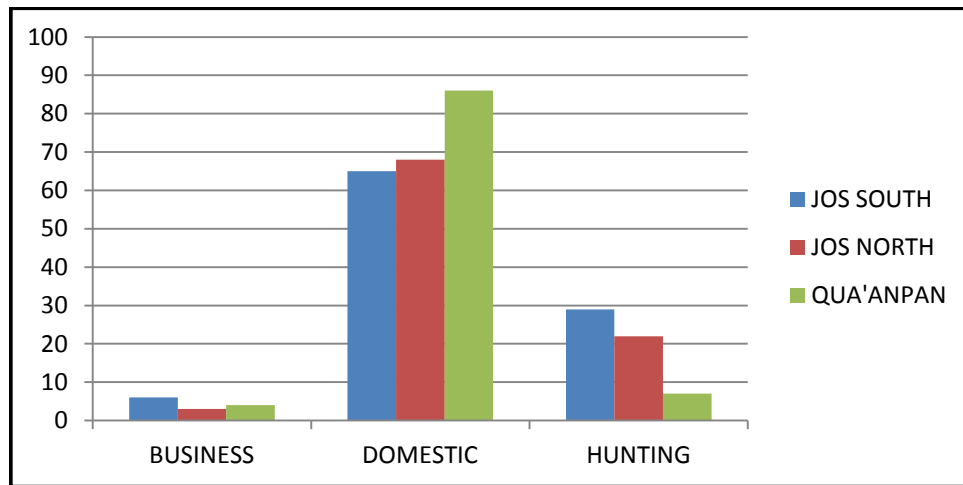


Figure 2:
Reason for Keeping Cat

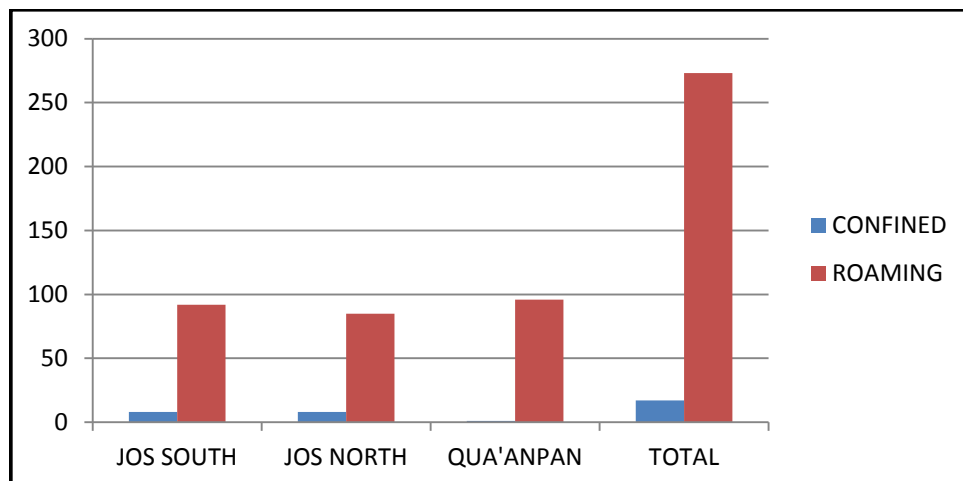


Figure 3:
Cats Management System



Table 1:
Awareness of Anti-Rabies Vaccine for Cat

Local Government	Aware of Anti-Rabies Vaccine for Cat	Not Aware of Anti-Rabies Vaccine For Cat
Jos South	17(17.0%)	83(83.0%)
Jos North	20(21.5%)	73(78.5%)
Qua'anpan	10(10.3%)	87(89.7%)
Total	47(16.2%)	243(83.8%)

Key: CI=2.919 to 28.41, t=5.288, d=2, p<0.05

Table 2:
Level of Awareness and Compliance of Anti-Rabies Vaccine for Cat

Local Government	Aware of Anti-Rabies Vaccine for Cat	Aware but Not Vaccinate	Aware and Vaccinate	
			First Dose	Booster Dose
Jos South	17(17.0%)	1(1%)	16(16%)	11(11%)
Jos North	20(21.5%)	7(7.5%)	13(14%)	10(10.8)
Qua'anpan	10(10.3%)	6(6.2%)	4(4.1%)	2(2.1%)
Total	47(16.2%)	14(4.8%)	33(11.4%)	23(7.9%)

CI=-23.23 to 13.23, t=0.6712, df=6) (P>0.05).

Table 3:
Causes of Death

Local Government	Sickness	Accident	Total Death
Jos South	19(19.0%)	14(14.0%)	33(33.0%)
Jos North	17(18.3%)	18(19.4%)	35(37.6%)
Qua'anpan	25(25.8%)	16(16.5%)	41(42.3%)
Total	61(21.1%)	48(16.6%)	109(37.7%)

Table 4:
Nature of Sickness

Local Government	Aggressive	Weakness	Salivation	Paralysis	Emaciated	Others	Total
Jos South	2(2.0%)	8(8.0%)	1(1.0%)	3(3.0%)	4(4.0%)	1(1.0%)	19(19.0%)
Jos North	1(1.1%)	4(4.3%)	0	4(4.3%)	8(8.6%)	0	17(18.3%)
Qua'anpan	2(2.1%)	5(5.2%)	0	9(9.3%)	9(9.3%)	0	25(25.8%)
Total	5(1.7%)	17(5.9%)	1(0.3%)	16(5.5%)	21(7.2%)	1(0.3%)	61(21.0%)

Table 5:
Dispose of Carcass

Local Government	Consumed	Buried	Discarded	Total
Jos South	1(1.0%)	20(20.0%)	12(12.0%)	33(33.0%)
Jos North	0	2(2.2%)	33(35.5%)	35(37.7%)
Qua'anpan	2(2.1%)	3(3.1%)	36(37.1%)	41(42.3%)
Total	3(1.0%)	25(8.6%)	81(27.9%)	109(37.6%)



Based on the reports by the subjects, a total number of 690 cats was owned by the subjects in the three Local Government areas used for this study.

Cat management system, out of 290 cat owners used in this study, only 17(5.9%) confined their cats while the remaining 273(94.1%) allowed their cats to be roaming. Of the total number of 100 subjects from Jos South Local Government; 8.0% confined their cats while the remaining 92.0% practices free-roaming cat management, the case is not different in Jos North Local Government where only 8.6% of 93 subjects confined their cats and 91.4% allowed their cats to be freely roaming.

However, in Qua'anpan Local Government, only 1(1.03%) out of 97 subjects confined their cats while 96(98.97%) used the free-roaming method. Statistically, we did not find a significant difference between confined and roaming methods of rearing cats ($p < 0.05$).

Discussion

We carried out this study to ascertain the level of awareness and compliance with the anti-rabies vaccine in cats, it was observed that the awareness level is very low in Plateau state despite the location of the National Veterinary Research Institute (N.V.R.I) in the same state.

From figure 1 75.5% of 290 subjects used in this research work reared cats for domestic purposes. The cats were free to mingle with people and possibly enter every nook and cranny of the house. Most (94.1%) cat owners practised the free-roaming method which is lethal to the health of animals and humans as these cats can be infected by rabies animals and thereby posing a great danger to the owner⁽²⁸⁾. Cats, much like dogs, tend to roam about, but are less vaccinated against rabies than their dog counterparts, thus making them more prone to the disease⁽²⁶⁾.

Only 8.0% of the subjects confined their cats in Jos South Local Governments likewise in Jos North 8.6% confined their cat while the worst case was observed in Qu'anpan Local Government where only 1 subject (1.03%) of 97 subjects confined his cats. The remaining 92%, 91.4% and 98.97% practised the free-roaming method in the three Local Government areas respectively (Figure 2). Statistically, there was no significant difference between the confined and roaming methods of rearing cats (P value is 0.03, $P < 0.05$). However, there is a possibility of an increase in the spreading of the rabies virus among animals due to the free-roaming method of rearing domestic animals and this in turn pose a great threat to human⁽³⁰⁾. Transmission of rabies virus is common through the saliva of an infected animal⁽³¹⁾ and this makes it easy for cats to infect other animals and even the owners as they may not have prior knowledge of their encounter with rabies-infected animals during roaming.

Generally, poor awareness of rabies and vaccination of domestic animals among the public inclusive of policymakers is of public health concern⁽³²⁾⁽³³⁾. The awareness level of anti-rabies vaccination for cats is very low in all the three local Governments where this study was carried out. Only 47(16.2%) out of 290 subjects were aware that cats need to be vaccinated against rabies while 243(83.8%) were not aware (Table 1). As commonly said that "knowledge is power", the findings of this research work clearly show the effects of people's ignorance about an anti-rabies vaccine for cats. There is a significant difference between those aware and those that were not aware of the anti-rabies Vaccine (P value = 0.011, $P < 0.05$).

On the other hand, the attitude of the people about vaccination is terrible, even those that claimed to know about anti-rabies vaccination for cats failed to vaccinate their cats.



Out of 16.2%, only 11.4% complied and vaccinated their cats. Of 33(11.4%) that vaccinated their cats; it was observed that their level of compliance is not complete as some of them failed to vaccinate their cats appropriately (Table 2). Some vaccinated their cats once and failed to give booster doses hence failing to protect the animal against rabies infection; although there was no significant difference between those that gave the first dose only and those that gave a booster dose ($P>0.05$). This is similar to the outcome of research in China where it was reported that vaccination of domestic animals is very low as a result of the knowledge gap and poor economic^{(30) (34)}.

In Nigeria, little or no attention is directed towards rabies infection in cats, rather most researchers give more attention to the disease in dogs than in other animals, hence, decreasing the reported number of rabies in cats, not minding the fact that cats are the second most affected animals after dogs^{(26) (35)}. The case of low awareness about anti-rabies vaccination for cats is not peculiar to Nigeria alone when compared with previous research work carried out in other countries; in Sri Lanka, a report of a survey carried out in 2020 shows that only 18% of 665 households were aware of anti-rabies vaccination for cats⁽³⁵⁾. Most of the previous surveys about awareness of the anti-rabies vaccine in Nigeria were targeted toward canines while little or no attention has been given to cats. In 2018, 82% awareness level was reported in Abuja⁽³⁶⁾, Ameh *et al*, 2014 reported 71.5% awareness in Taraba while 76.5% awareness was reported in Nassarawa^{(37) (38)} but all these surveys were centred on awareness of anti-rabies vaccine in dogs (canine) but less attention was given to cat⁽³⁷⁾.

Though those that vaccinated their cats and those that did not experience the death of their cats, likewise those that are aware and those that were not aware of anti-rabies

vaccination for cats recorded numbers of death among their domestic cats the cause of death differs as some died as a result of sickness while some died due to accidents. Out of 290 subjects, 109(37.6%) experienced the death of their cat while 181(62.4%) had never recorded the death of their cats. 48(16.6%) of the total death reported were due to accidents while 61(21.1%) were a result of sickness with different symptoms as reported in Table 3.

Those that lost their cat as a result of sickness observed different symptoms that can be attributed to rabies infection. Out of 61(21.0%) of cats that died as a result of sickness, Symptoms like aggressive 5(1.7%), weakness 17(5.9%), salivation 1(0.3%), paralysis 16(5.5%), emaciation 21(7.2%) and others (unknown cause) 1(0.3%) were observed by those that lost their cats across the 3 local governments used in this research as reported and shown in Table 4. Paralysis and other symptom listed in this survey are parts of the symptoms of rabies virus infection⁽³³⁾.

From Table 5; out of 109(37.6%) total death of cats reported at the time of this study across the 3 local governments used, 81(27.9%) discarded the carcass, 25(8.6%) buried the carcass while the remaining 3(1.0%) consumed the carcass. Lorraine *et al*, 2014, experimented on "Effects of carcasses decomposition on rabies virus infectivity and detection" they were able to isolate the virus from a carcass that had been buried for 70days, if this is possible then, those carcasses that were thrown away could cause more danger as other animals can easily feed on them and thereby get infected by the rabies virus. The worst can happen to those that consume the carcass if the animal is infected⁽³⁸⁾.

Conclusion

From this survey, only a few people knew about the rabies virus and the associated danger. Many people believed that rabies is a disease in dogs. Awareness and compliance with



the anti-rabies vaccine for cats was also very low.

Conflict of interest

There is no conflict of interest in this work

Authors contribution

Ogundeji Ebenezer Bukola designed this work and was involved in all the stages as principal investigator, Onyemelukwe Ngozi and Ishaya Sinni Tekki supervised this work, Ogundeji Alice Oluwapelumi, Zhakom Ponfa Nden, Eze Kanayo and Livinus Clement Jona participated in distribution and collation of questionnaires while Ajayi Olawunmi Toyin and Onuoha Macdonald Nwabueze carried out the statistical analysis.

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Availability of Data

Available upon request.

Author contact email

1. Ogundeji Ebenezer Bukola -
ebenezerogundeji@gmail.com
2. Onyemelukwe Ngozi Felicia -
ng_onyemelukwe@yahoo.com
3. Ishaya Sinni Tekki -
ishaya.sinitekki@yahoo.com
4. Ogundeji Alice Oluwapelumi -
pelumibukky@gmail.com
5. Zhakom Ponfa Nden -
zhakompon@gmail.com
6. Ajayi Olawunmi Toyin -
wunmsi@yahoo.com
7. Onuoha Macdonald Nwabueze -
onuoha1960@yahoo.com
8. Eze Kanayo A. - flashkanny@yahoo.com

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