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Short Communication

Incidences of animal bite and risk for rabies in Kaduna State, Nigeria- a public health implication

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ABSTRACT

This study focused on the incidence of animal bite (n=50) reported in Kaduna State, Nigeria, between January and April 2024, focusing on factors such as the type of biting animal, sex of the victims, geographical distribution, temporal trends, and the nature of the bites. The data were sourced from weekly reports submitted by Area Veterinary Officers to the Department of Veterinary and Livestock Services and were supplemented with rabies test results from the National Veterinary Research Institute (NVRI), Vom, Plateau State. Results revealed that dogs were responsible for 96% of the biting incidents, while cats accounted for 4%. Male victims were more frequently bitten, and the highest incidence was reported in Kaduna Central (Zone 2) with 44% and Zaria being the lowest (12%). Most incidents occurred in February (38%) and March (34%). Provoked bites constituted 52% of the cases, and 86% of the dogs involved were not vaccinated against rabies. Rabies test results showed that 94% were negative, while 6% tested positive, all of which were reported in Kaduna South (Zone 3). A significant association (p=0.034) between senatorial zones and rabies test results was observed, indicating a need for targeted public health interventions in specific zones. The study underscores the need for improving vaccination coverage and implementing educational campaigns to mitigate risk of rabies and reduce the incidence of animal bites. Enhanced public health strategies, community engagement and one health approach should be implemented to address the multifaceted challenges posed by dog bites and rabies in Kaduna State.

Keywords: Animal bite, Epidemiology, Rabies, Kaduna State, Nigeria

INTRODUCTION

Rabies is a deadly viral disease that affects certain warm-blooded animals, caused by a virus from the Rhabdoviridae family. It is primarily transmitted through bites from animals such as dogs, cats, bats, and monkeys (CDC, 2024a). Dog-bites account for tens of millions of injuries annually worldwide, with incidence rates varying across different regions. For instance, in the United States, approximately 4.5 million people are bitten by dogs each year (Blanton *et al*., 2015). In low and middle-income countries, data are more fragmented, but studies reveal that dogs are responsible for 76-94 % of animal bite-injuries (WHO, 2024). The risk of rabies is significant, especially from bites by rabid dogs, leading to an estimated 59,000 deaths annually, with higher fatality rates in resource-poor settings due to limited access to post-exposure treatment and appropriate healthcare (WHO, 2023). Rabies transmission occurs primarily through direct contact with the saliva or brain tissues of an infected animal, usually via bites. The virus enters the body through broken skin or mucous membranes in the eyes, nose, or mouth (CDC, 2024b). While bites are the most common transmission mode, non-bite exposures such as scratches, abrasions, or open wounds in contact with saliva or other infectious materials can also lead to rabies, although this is

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less common (CDC, 2024b). Symptoms of rabies in humans vary but often begin with nonspecific signs like fever, headache and anxiety. As the disease progresses, more severe neurological symptoms develop, including aggression, convulsions, hypersalivation, hydrophobia, hallucinations, paralysis, and hyperventilation (WHO, 2023). Globally, over 59,000 people die from rabies each year, with 99% of these deaths occurring in African and Asian countries where dog rabies is endemic (Nyasulu *et al.*, 2021). In Nigeria, human rabies is a significant public health issue, with frequent outbreaks and challenges in implementing a comprehensive national prevention and control program (Ishaya *et al.*, 2016). Between 1978 and 2020, studies in Nigeria reported varying *Rabies virus* antigen detection rates from 3% to 28%, with most dog-bites being unprovoked and the biting dogs often having low vaccination rates (Mshelbwala *et al.*, 2021). Indigenous dogs, primarily used for security, accounted for most of the dog population, with vaccination rates varying between 15% and 38% across most states (Mshelbwala *et al.*, 2021).

STUDY AREA AND SETTING

The study was conducted in Kaduna State, Nigeria, which has three senatorial zones: Kaduna Central, Kaduna South, and Kaduna North. The state comprises 23 Local Government Areas (LGAs), each with state-owned veterinary clinics that report animal bite incidents (Figure 1).

ETHICAL CONSIDERATIONS

Ethical approval for data collection and analysis was obtained from Kaduna State Ministry of Agriculture, Department of Veterinary and Livestock Services. Confidentiality of the victims and animal owners was maintained throughout the study, and data were anonymised to protect privacy of individuals involved in the incidents.

DATA COLLECTION

Data for this study were collected from the weekly dog bite reports submitted by area veterinary officers to the Department of Veterinary and Livestock Services, Kaduna State. These reports included detailed records of animal-bite cases reported to the veterinary clinics across the 23 LGAs. Additionally, rabies test results were obtained from the National Veterinary Research Institute (NVRI) in Vom, where samples from biting animals suspected of having rabies were tested. Area veterinary officers compiled and submitted weekly reports detailing animal-bite cases, including information on the type of biting-animal, sex of the victims, location of the incidents (LGA and senatorial zone), the month of occurrence, the type of bite (provoked or unprovoked), and vaccination status of the biting-animals. For animals suspected of having rabies, samples were collected and sent to NVRI, Vom, for laboratory testing, and the results were recorded as either positive or negative for rabies. The test results from NVRI Vom were cross-referenced with the weekly reports to ensure consistency and accuracy of the data.

The collected data were categorized as follows: type of biting animal (dog bites and cat bites), sex of victims (categorized as male or female), geographical distribution (each reported incident was assigned to one of the 23 LGAs and grouped into Kaduna Central : Zone 2, Kaduna South : Zone 3 and Kaduna North :Zone 1), temporal distribution (incidents were recorded based on the month of occurrence from January to April), type of bite (classified as provoked or unprovoked), vaccination status of biting animals (determined whether dogs involved were vaccinated or not vaccinated against rabies), and rabies test results (recorded as positive or negative), based on laboratory testing conducted at NVRI, Vom.

DATA ANALYSIS

Data were presented in tables and figures to illustrate distribution of animal-bite cases by LGA, senatorial zone, month of occurrence and other relevant categories. Frequencies and percentages were calculated for each variable, providing an overview of distribution of animal-bite cases across different categories. Chi-square test was performed to examine the association between senatorial zones and rabies test results, with the significance level set at $P \leq 0.05$ using statistical package for social science (SPSS, Version 25, USA).

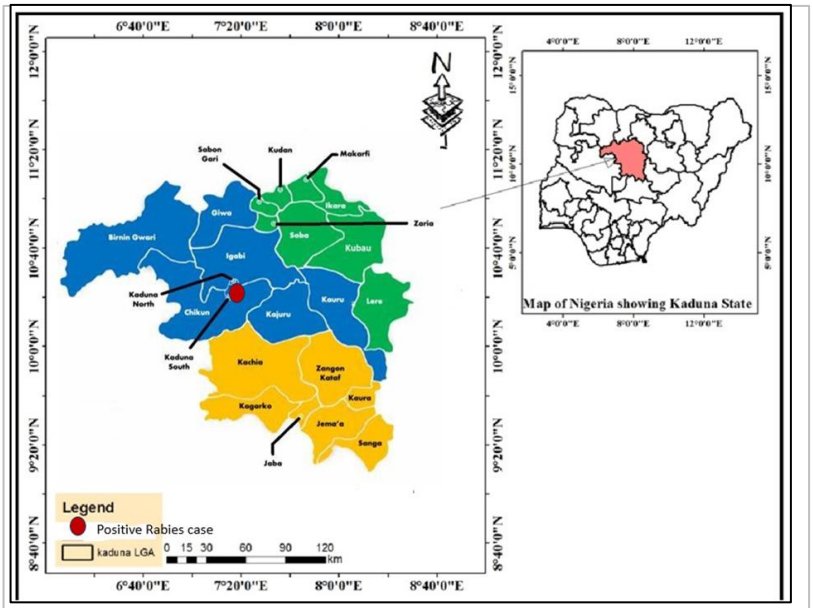

Figure 1. A Map of Kaduna with the LGAs and positive

RESULT

Dogs accounted for 96% (48 cases) of the biting incidents, while cats were responsible for the remaining 4% (2 cases). Male victims constituted 68% (34 cases) of the total, with female victims making up the remaining 32% (16 cases: Table 1). Incidents were reported across various LGAs, with Chikun (16%), Kaduna North (14%) and Zaria (12%) having the highest frequencies, while other LGAs reported lower frequencies ranging from 2% to 8%. (Table 2) In terms of senatorial zones, Kaduna Central (Zone 2) had the highest frequency of incidents at 44% (22 cases), followed by Kaduna South (Zone 3) with 32% (16 cases), and Kaduna North (Zone 1) with 24% (12 cases: Table 1). Most incidents occurred in February (38%) and March (34%), with April and January having lower frequencies at 18% and 10%, respectively. Provoked bites constituted 52% (26 cases), while unprovoked bites made up 48% (24 cases: Table 1). Regarding vaccination status of dogs, a significant majority (86%, 43 cases) were not vaccinated, with only 14% (7 cases) being vaccinated. Rabies test results indicated that 94% (47 cases) of the tests were negative, while 6% (3 cases) were positive for rabies (Table 1).

Kaduna South (Zone 3) had all the positive rabies cases (3), in Sanga, Jama'a and Zango Kataf LGAs while no positive case was reported in Kaduna North (Zone 1) and Kaduna Central (Zone 2). The chi-square test showed a significant association (P = 0.034) between senatorial zones and rabies test results. Most unvaccinated dogs were from Kaduna Central (Zone 2) (17 out of 22 cases), and vaccination was rare across all zones, with the highest number (5 out of 7) in Kaduna Central (Zone 2: Table 1).

Table 1. Categorization of bite variables reported to veterinary clinics in Kaduna State

Variable	Category	Freq. (%)
Type of Biting	Dog	48 (96%)
Animal	Cat	2 (4%)
Sex of Victims	Male	34 (68%)
	Female	16 (32%)
Local Government	Chikun	8 (16%)
Area (LGA)	Kaduna North	7 (14%)
	Zaria	6 (12%)
	Others (Various LGAs)	29 (58%)
Senatorial Zone	Kaduna Central (Zone 2)	22 (44%)
	Kaduna South (Zone 3)	16 (32%)
	Kaduna North (Zone 1)	12 (24%)
Month	February	19 (38%)
	March	17 (34%)
	April	9 (18%)
	January	5 (10%)
Type of Bite	Provoked	26 (52%)
	Unprovoked	24 (48%)
Vaccination Status of Dog	Not Vaccinated	43 (86%)
	Vaccinated	7 (14%)
Rabies Test Results	Negative	47 (94%)
	Positive	3 (6%)

DISCUSSION

Given the low vaccination rates among biting-dogs and the significant number of unprovoked bites, there is a considerable risk of rabies transmission in Kaduna State. Notably, all positive rabies cases were reported in Kaduna South (Zone 3), while no positive case was found in Kaduna North (Zone 1) and Kaduna Central (Zone 2). This geographical variation highlights areas that may require more focused public health interventions, including enhanced vaccination drives and public awareness campaigns (Subedi *et al*., 2022). Presence of more cases in certain areas might also reflect higher dog populations or inadequate control measures in those regions (Madaki *et al*., 2023). The significant association between the senatorial zones and rabies test-results underscores the need for targeted public health interventions to address the risk of rabies, particularly in Kaduna South. These findings highlight the importance of improving vaccination coverage and implementing educational campaigns to reduce the incidence of animal-bites and the risk of rabies in the affected zones (Subedi *et al*., 2022). The public health impact of dog bites and rabies is multifaceted, encompassing health consequences, economic burdens, and social and psychological effects on victims (Burgos-Cáceres, 2011). Health consequences of dog bites include severe physical injuries such as deep wounds, infections, and in some cases, permanent disability (Ali & Ali, 2022). The risk of rabies infection from dog bites is particularly concerning, as rabies is nearly always fatal once symptoms appear. Immediate medical attention and post-exposure prophylaxis (PEP) are crucial to prevent onset of rabies after a bite from a

Table 2. The frequency and percentage of reported animal bite cases in various local government areas (LGAs) in Kaduna State

LGA	Frequency (%)
Kaduna South	4 (8.0%)
Kaduna North	7 (14.0%)
Chikun	8 (16.0%)
Igabi	3 (6.0%)
Sanga	1 (2.0%)
Zangon/Kataf	4 (8.0%)
Jaba	2 (4.0%)
Jema'a	4 (8.0%)
Kachia	2 (4.0%)
Kaura	3 (6.0%)
Lere	3 (6.0%)
Kauru	1 (2.0%)
Zaria	6 (12.0%)

Ikara	1 (2.0%)
Sabon gari	1 (2.0%)
Total	50 (100.0%)

potentially rabid animal (Ogundare *et al.*, 2017). The economic burden of dog bites and rabies on healthcare systems is significant, with costs including emergency care, vaccination, long-term treatment for injuries, and public health campaigns to control and prevent rabies (John *et al*., 2021). In resource-poor settings, the financial strain is even greater due to limited access to vaccines and healthcare services, exacerbating the challenges in managing and preventing rabies effectively (Hampson *et al*., 2015).

Victims of dog-bites and rabies often experience considerable social and psychological distress (Mshelbwala *et al.*, 2021). The trauma from the attack can lead to long-term mental health issues such as anxiety, post-traumatic stress disorder (PTSD) and depression. Additionally, stigma associated with rabies and dog-bites can result to social isolation and discrimination. Families of victims also suffer emotionally and may face financial hardship due to medical expenses and loss of income (Beyene *et al*., 2018).

CONCLUSION

The analysis of animal-bite cases reported to veterinary clinics in Kaduna State reveals several important findings. Dogs were the primary biting-animals, with males being more frequently bitten than females. Incidents were distributed across various local government areas (LGAs), with Chikun having the highest frequency followed by Kaduna North, and then Zaria. Kaduna Central emerged as the senatorial zone with the highest incidence of dog-bite cases. Most incidents occurred in February and March, with a significant proportion of bites being provoked. Additionally, majority of dogs involved were not vaccinated, and while rabies was relatively rare, positive cases were exclusively found in Kaduna South. It is recommended that

Kaduna State Government should launch comprehensive public awareness campaigns to educate residents on responsible pet ownership, the importance of vaccination against rabies, and safety measures to prevent dog-bites. The Government should also implement vaccination programs targeting dogs across all senatorial zones, with a particular focus on areas with high incidences of dog bites. There is need to strengthen surveillance systems to promptly identify and report dog-bite cases, allowing for timely interventions and medical treatment for victims while existing laws and regulations related to dog ownership, including licensing, leash laws, and penalties for irresponsible pet ownership, should be reviewed and enforced adequately.

CONFLICT OF INTEREST

There was no conflict of interest.

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