



Rabies Ecology in Bauchi State, Nigeria

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ABSTRACT

Despite availability of safer and cost-effective treatments and vaccines, rabies is still considered among the most fatal viral zoonotic disease worldwide. The epidemiology of rabies is directly associated with the ecology of the reservoirs which needs better understanding to underpin appropriate control measures. There are only few reported attempts made towards understanding the ecology of dog and rabies cases in Nigeria. Although dogs are tolerated and kept in Bauchi State, the risk factors associated with dog ownership in the state, remain to be studied. This study is aimed at determining the risk factors associated with dog ownership in Bauchi state and to evaluate the degree with which the presence or absence of the identified factors can increase or decrease risk of rabies cases in the state. A questionnaire-based survey was conducted amongst dog owners across the state. Basic descriptive analyses were carried out in Microsoft Excel 2016 and IBM SPSS 21 was used to determine the relative risk (RR) of rabies occurrence in households across the state when exposed to each of the identified risk factors where P-value was set at 0.05. A total of 80 questionnaires were completed and received from the respondents. The calculated RR, revealed that the practice of extensive system of management increases the risk of canine rabies amongst dogs of the state by 80% and knowledge of dog owners about canine rabies reduces the risk of canine rabies by 27%. This study confirmed that dogs are owned and tolerated but poorly managed under extensive management system in Bauchi state with increasing risks of rabies spread due to low vaccination coverage and lack of practical application of knowledge on the dangers of rabies amongst the populace. The public health implication of this situation and the need for concerted efforts for sustainable control of rabies in the state is discussed.

Keywords: Rabies, ecology, vaccination, Bauchi state, Nigeria

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INTRODUCTION

Rabies is a vaccine-preventable fatal viral disease of human and mammals. The disease is caused by the Rabies virus, a member of the lyssavirus genus (family Rhabdoviridae) of neurotropic, single stranded, negative-sense RNA viruses capable of producing fatal encephalitis in a wide variety of mammalian species [1]. Despite the availability of safer and more successful treatments and effective vaccines, rabies is still considered among the most important and devastating viral zoonotic disease worldwide [2].

Rabies is worldwide in distribution except for few island nations and in North America and Europe. Wildlife species have replaced dogs as the most important reservoirs of rabies [3]. There is increasing incidence of rabies in dogs and wildlife in Africa and most people are at risk of being exposed to rabies easily because of interactions at the human/dogs/wildlife interface level [4, 5]. In Nigeria, the domestic dog is still regarded as the primary reservoir host for rabies affecting humans and animals [6, 7, 8, 9, 10].

In Nigeria, about 10,000 people are exposed to Rabies each year [11]. The increasingly rise in rabies cases amongst dogs, other domestic animal species and human population in Nigeria is of serious concern as it poses grave danger to the health status of the general public [12, 13, 14, 15]. Well-designed dog ecology and demographic studies are therefore necessary [16]. They have proved useful in planning rabies control in Asia, America, Europe and the north, east and southern Africa [17].

The epidemiology of rabies is directly associated with the ecology of the reservoirs which needs better understanding to design appropriate control measures [4]. There are very few epidemiological studies of dog bites and cases of rabies in Nigeria [12, 14, 18, 19].

The risk factors associated with dog ownership in Bauchi State, remain to be studied. This present study is aimed at determining the risk factors associated with dog ownership in Bauchi State, Nigeria and to evaluate the degree with which the presence or absence of the identified factors can increase or decrease the number of rabies cases in the State.

MATERIALS AND METHODS

Study Area

The study was conducted in Bauchi State located between longitude 9° 15'E to 10° 43'E and latitude 9° 55'N to 12° 45'N in the Northern Guinea/Sudan savannah zone of Nigeria [20]. It covers a total land area of 66,514 square kilometers and has 20 Local Government Areas (LGAs). The state has an estimated population of about 5 million people based on 2006 census. It has an annual rainfall of between 875 to 1075mm. It shares borders with Plateau and Kaduna States to the west, Kano and Jigawa States to the north, and Yobe, Gombe, and Taraba States to the north-east [20, 19].

Study Design

A cross sectional questionnaire-based survey was undertaken amongst dog owners across Bauchi State and a verbal consent from the owners was a prerequisite to participate in the present survey. The questionnaire was pre-tested to ensure the comprehensibility of the questions contained by the dog owners. The questions in the questionnaire focused mainly on (1) why and how the owners rear and keep their dogs safe and healthy and (2) on owners' knowledge about the mode of transmission, clinical signs, control of canine rabies and where to diagnose the disease in Bauchi State. A total of 115 dog owners were approached across the state and only 80 of them gave their consent and participated in this study.

Statistics

The responses of the dog owners were entered and sorted out in Microsoft Excel 2016. Basic descriptive analyses were also carried out in Excel.

The IBM SPSS 21 was used to determine the relative risk (RR) of rabies occurrence in households across the state when exposed to each of the identified risk factors. P-value was set at 0.05 to determine the RR for each factor.

In this study, the relative risk (RR) indicates how many times (more or less) likely that dog(s) exposed to a given risk factor develop rabies relative to the unexposed dog(s).

$$RR = \frac{\text{Incidence of rabies with exposure to the given risk factor}}{\text{Incidence of rabies without exposure to the given risk factor}}$$

Interpretation of results of RR:

RR > 1: there is increased risk of rabies occurrence;

RR = 1: no risk of rabies;

RR < 1: there is reduced risk of rabies.

RESULTS

Characteristics of the dog owners and their basic knowledge of rabies

Only 13 (16%) of the respondents keep more than one dog at any point in time and 67 (84%) had one dog at a time. 34 (43%) of the respondents keep dogs only for security purpose; 8 (10%) of respondents keep dogs for hunting; 10 (13%) of the dog owners keep dogs for security and hunting purposes and 2 (3%) respondents keep dogs for breeding. Only 10 (12%) respondents slaughter dogs for consumption. 10 (13%) of the dog owners intensively managed their dogs; 56 (70%) of them practice the extensive system of management and 14 (17.5%) of the respondents semi-intensively managed theirs.

Only 15 (19%) of the respondents sell dogs; seven of this fifteen respondents recorded rabies cases amongst their dogs in the past. 59 (74%) of the respondents know about rabies disease, however, only 28 (35%) of the total respondents could describe the typical signs of canine rabies. 14 (5%) of the dog owners confirmed they had recorded canine rabies amongst their dogs in the past.

Route/Mean of Transmission

58 (63%) respondents have seen rabid dog(s) in the past and only 15 (30%) of these cases of rabid dogs were reported to the available veterinary authority for necessary control action. 14 (28%) of the respondents have no idea what happened to the rabid dog. However, out of the remaining 21 rabid dogs; 4 were confirmed to have died on their own, 20 were killed, 7 ran off and 5 were slaughtered and consumed. 39 humans, 16 dogs and 3 cattle victims with dog-bite injury were recorded in 43 cases of the 50 retrospective rabid cases. Only 24 of the 39 (62%) human victims of dog bite received post-exposure treatment and 15 did not receive post-exposure treatment.

Prevention/Vaccination

60 (75%) of the dog owners know about vaccination of dogs against canine rabies. 28 (35%) of the dog owners have record of previous vaccination of their dogs against rabies and only 16 of them had their vaccination record up to date. All the respondents with up to date vaccination records use the National Veterinary Research Institute (NVRI) anti rabies vaccine.

Risk Factors

The major risk factors as provided by the respondents are mainly the management system of the dogs and the level of knowledge of the dog owners about the disease.

Table 1: Calculations and interpretations of the relative risk for each of the risk factors indicated by the respondents.

Risk factors	Relative Risk	P-value	Interpretation
Extensive system of management	1.8	0.05	The extensive system of management increases the risk of canine rabies amongst dogs of the state. The risk is increased by 80%.
Semi-intensive system of management	0.17	0.05	The practice of semi-intensive system of management reduces the risk of canine rabies amongst dogs of the state.
Intensive system of management	0.077	0.05	Intensive system of management of dogs reduces the risk of the canine rabies in the state
Knowledge about rabies	0.27	0.05	The knowledge of dog owners about canine rabies reduces the risk of canine rabies amongst dogs in the state.

DISCUSSION

The study has shown that most dog owners in Bauchi keep at least a dog in their compound with very few households keeping more than one dog an indication that dogs are kept and tolerated in Bauchi State. On the purpose of keeping dogs, the study showed that dogs are primarily kept for security purposes including safeguarding houses, livestock, farm crops from predators and business premises; these reasons are similar to reports from Zimbabwe [21], Mexico City [22], Ecuador [23], Chad [24] and Madagascar [25]. Despite this important service provided by the dogs, their care and management are always poor, most of them are kept under extensive management system, as such, they are poorly fed, not confined, and so forced to move around the neighborhood in search of what to eat from refuse dumps. Such dogs are referred to as 'neighborhood' or 'community' dogs [17]. This

type of management of the domestic dogs has also been reported in Ecuador [23], Zambia [26], Zimbabwe [27] and Nigeria [28]. This present study has shown that extensive management of dogs significantly increases the risk of canine rabies amongst dogs in the State. Despite the fact that more than 50% of the dog owners know about rabies disease with some of them having the experience of seeing confirmed cases of canine rabies among their dogs they however seemed to be careless about the dangers of rabies and the importance of responsible dog ownership. Most of their dogs are recognizable and traceable to specific owners and they enjoy free range. A dog from one household is permitted to wander the neighborhood and may be offered food in other households. This promotes straying, encourages the gathering of dogs in packs and facilitates easy contact between dogs and humans/domestic animals and cycle of

endemic canine rabies can be easily maintained. The inability of some of the dog owners to understand clinical signs of rabies portends danger as this facilitates increased humans and animals exposure risk to rabies in the study area. Even though dogs are kept and tolerated in Bauchi, the culture of the people does not tolerate dog meat consumption this could account for the few number of dog owners who slaughter their dogs for consumption purpose during the study. The discrepancies on characteristics of dog owners in the study area could be attributed to differences in socio-cultural, economic and religious beliefs of the inhabitants of the different study areas in the state. The respondents who had knowledge of cases of dog bites in this present study suggests that dog bite cases do occur frequently among family members and the dog bite victims were mostly bitten by dog with owners (household dogs and neighbors' dogs). Similar findings have also been reported [14, 18, 29]. This suggests that circumstances of dog bite or transmission of rabies is not always due to stray dogs but even the owned dogs may be involved in transmission of rabies. Of immense concern is the inability of some of the dog bite victims to report such incidences to veterinary clinics and or human hospitals for necessary control action, this is a possible reflection of lack of knowledge on the transmission means and dangers of rabies among the public, majority of the victims prefer non-specific management approaches like traditional medication and/or use of herbs and in most situations this type of management of rabies exposures in humans and animals have failed in saving the lives of such victims. Most people that died of rabies have either never been treated or have received some treatment, which is not in accordance with the World Health Organization (WHO) protocol [5]. The fact that cases in dogs, humans and cattle were reported in this study, means that all

other domestic animals and humans are at risk of continuous exposure to the rabies virus. This is of public health and socio-economic concern. The study showed that dog owners know about vaccination of dogs against rabies but do not take their dogs to veterinary clinics for rabies vaccination which is indicative of the low rabies vaccination coverage observed in this study. This is insufficient to control the spread of rabies and also indicative of lack of awareness amongst the general public on the dangers of rabies posed by unvaccinated dogs in the study area and/or indication of the inability to afford the cost of annual vaccination of their dogs against rabies [29]. To have an effective control of rabies, vaccination coverage of 70-75% is considered highly necessary [17] in addition to employing the one health approach [30].

Conclusion and recommendation

This present study has shown that dogs are owned and tolerated but poorly managed under extensive management system in Bauchi State with increasing risks of rabies spread due to low vaccination coverage with concomitant lack of knowledge on the dangers of rabies among the populace. In view of the public health importance of rabies, there is need for government and the general public to put more effort in the prevention and control of rabies through proper post exposure management of victims and enlightenment campaigns to general public on responsible dog ownership and vaccination against rabies, dangers of rabies and proper actions needed to be taken following dog bites.

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Competing Interests

The authors declare that they have no competing interests.

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