



Risk Factors Responsible for Canine Rabies in Zamfara State, Nigeria

Ijoma, S.I.^{1*}; Ahmad, I.²; Waziri, I.A.³, Bolajoko, S.M.B.⁴

¹Epidemiology Unit, Central Diagnostics Division, National Veterinary Research institute, Vom, Jos, Nigeria.

²Directorate of Animal Health and Livestock Development, Gusau, Zamfara, Nigeria. ³National Veterinary Research institute, Vom, Jos, Nigeria. ⁴Epidemiology Unit, Central Diagnostics Division, National Veterinary Research institute, Vom, Jos, Nigeria. *Corresponding author: Email: sandraijomaiifeoma@gmail.com;

Mobile:+ 2347030091796

SUMMARY

The global community aims to eliminate human deaths from dog mediated Rabies by 2030. For Nigeria, a rabies endemic country to join the list of countries that have successfully eliminated rabies, there is need for more risk factor studies that addresses her peculiar environment. This study identifies risk factors responsible for rabies cases in Zamfara, Nigeria. A cross-sectional descriptive survey was carried out among dog owners in Zamfara State by administering questionnaires. Seventy questionnaires were administered directly to dog owners across fourteen Local Government Areas (LGAs) of Zamfara state to identify the possible risk factors and IBM SPSS 21 was used to determine the relative risk of Canine Rabies incidence across the state when exposed to each of the identified risk factors. The knowledge of rabies is very poor (17%) among the dog owners, with only 9% of the total respondents that were able to describe the clinical signs and symptoms of the disease in dogs. Only 5% of the respondents have record of previous vaccination of their dogs against Rabies. Extensive system of management increased the risk of the disease among dogs of the state by 80% and caused its spread from infected to un-infected dogs. Risk factors identified could be likely hindrances to eradicating Canine Rabies in the State. It is hoped that results of this study will encourage other States to carry out similar investigation to aid understanding the sustenance dynamics of the disease.

Keywords : Canine, Nigeria, One Health, Rabies, Risk factors, Zamfara State

INTRODUCTION

Rabies is one of the most highly neglected viral zoonotic diseases in Africa caused by Rabies virus belonging to the family *Rhabdoviridae* and genus *Lyssavirus* affecting both animals and; humans causing 100% human case fatality rate (Hambolu *et al.*, 2014; Chowdhury *et al.*, 2015; Coetzer *et al.*, 2019). Globally, there have been over 59,000 human deaths caused by rabies (Hampson *et al.*, 2015; Taylor *et al.*, 2015). Economically, rabies

is responsible for more than 3.7 million (95% CI: 1.6–10.4 million) disability-adjusted life years (DALYs) and 8.6 billion USD (95% CI: 2.9–21.5 billion) in yearly losses (Hampson *et al.*, 2015). In Africa, post-exposure prophylaxis (PEP) against rabies costs USD 40 which can create huge financial burden on affected families that earn around USD 1–2 per person daily (WHO, 2017). Furthermore, rabies is also a cause of considerable livestock losses (Taylor *et al.*, 2015;

Kaltungo *et al.*, 2018). Although other reservoirs exist, unvaccinated dogs have been identified as major reservoirs and vectors of the disease (Knobel *et al.*, 2005; Aworh *et al.*, 2011; Ehizibolo *et al.*, 2011; Idachaba and Bolajoko, 2018). Globally, canine rabies exists on all continents, except Antarctica and more than 95% of the global deaths occur in Asia and Africa where it is often spread by bites or scratches, via saliva from rabid dogs to both man and animals (FAO, 2013; Meseko, 2014; Kaltungo *et al.*, 2018). In Nigeria, the disease is endemic (Kaltungo *et al.*, 2018). Canine rabies was first diagnosed in Nigeria in 1912 (Bolajoko *et al.*, 2019) and within 1928 and 1990, Three thousand five hundred and fifty-five (3,555) of 3770 cases were confirmed in the dogs and had been diagnosed at the National Veterinary Research Institute, Vom - Nigeria – NVRI (Aworh *et al.*, 2011; Bolajoko *et al.*, 2019). Rabies control programmes are being executed in several countries, with quite a number of successes being seen with enhanced dog vaccination coverage, better accessibility to PEP and decreased human deaths. The global community aims to eliminate human deaths from dog mediated Rabies by the year 2030. For Nigeria to join the list of other countries that have successfully eliminated Rabies, there needs to be more risk factor studies that addresses the Country's peculiar environment. In Nigeria over the past several decades, although the dog population has been increasing, little progress little progress has been made in reducing the disease occurrence in dogs in Nigeria (Davlin and VonVille, 2012). Furthermore there has been lack of precise risk assessment data in the Country (FAO, 2008; Hambolu *et al.*, 2014; Bolajoko *et al.*, 2019). In the case of Rabies just like other zoonotic diseases, there is a need for risk analysis to be exploited in Nigeria to achieve sustainable control of the disease (FAO, 2008; Waziri *et al.*, 2017). Even though there have been a few studies on

risk factors, very few studies have quantified degree with which these factors are responsible for the transmission of Rabies in Nigeria (Waziri *et al.*, 2017). The aim of this study is to determine and assess the possible risk factors responsible for Rabies occurrence in Zamfara State, Nigeria.

MATERIAL AND METHODS

Study Location

Zamfara State is currently in north-west Nigeria, between Latitudes 37° N to 12°42N and longitudes 23°E to 5°52E having an altitude of 420m and a land mass spanning 39,762 square kilometres (Mohammed *et al.*, 2015; Ahmad *et al.*, 2017). In 2006, it had about 3,259,846 people and in 2016, this population rose to 4,515,427 (NPC, 2006). It is bounded by Sokoto State and Republic of Niger in the north, Katsina State in the west, Kaduna State in the south, Niger State and Kebbi State (Mohammed *et al.*, 2015; Ahmad *et al.*, 2017).

Study Design

A cross-sectional descriptive survey was carried out among dog owners in Zamfara State by administering questionnaires as approved by the National Veterinary Research Institute Animal Ethics Committee (AEC). A verbal consent from the respondents, following the explanation of details and objectives of the study was approved by the AEC as a prerequisite to participate in the present survey. All respondents were adult and their individual informed verbal consent were documented by each respondent appending their names and contact details on their individual questionnaire paper and then answering the questions therein. Oral consent was adopted for this study by the AEC committee for cultural reasons and to reduce formality. A total of 70 dog owners were approached across the fourteen local government areas (LGAs) of Zamfara State. And only 66 of them gave their consent and participated in this study to

identify the possible risk factors and to assess to what degree these factors are responsible for canine rabies cases/outbreaks in the State. The fourteen LGAs include Maradun, Bungudu, Maru,

Bakura, Tsafe, Gusau, Shinkafi, Zurmi, Birnin Magaji, Kaura Namoda, Anka, Bukyum, Gummi and Talata Mafara (See Table 1 below).

TABLE I: Distribution of the administered and returned questionnaires by the dog owners in the fourteen LGAs surveyed in Zamfara State.

Local Government Areas	Number of questionnaires administered	Number of questionnaires completed and returned
Maradun	5	4
Bungudu	5	5
Maru	5	5
Bakura	5	5
Tsafe	5	5
Gusau	5	4
Shinkafi	5	5
Anka	5	5
Birnin Magaji	5	5
Zurmi	5	5
Talata Mafara	5	5
Bukyum	5	5
Gumi	5	5
Kaura Namoda	5	3

TABLE II: Number of clinical cases of Canine -Rabies as provided by the respondents across Zamfara State.

Local Government Areas	Number of clinical cases of Canine -Rabies
Bukyum	3
Gummi	4
Kaura Namoda	3
Zurmi	9
Shinkafi	5
Bakura	1
Tsafe	1
Maru	2
Bungudu	4
TOTAL	32

Microsoft Excel 2016® was used to sort out the responses from the respondents and to determine the basic descriptive epidemiology of Rabies in the State. The IBM SPSS 21® was used to determine the relative risk (RR) of Rabies incidence 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) determines how many times likely that dog(s) exposed to a given risk factor

develop Rabies relative to unexposed dog(s).

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

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

Thirty-two (49%) of the respondents kept more than one dog at any point in time and the rest kept only one dog. Thirty-four (52%) of the respondents kept dogs only for hunting and twenty-one kept dogs for security purpose. None of the respondent sold or slaughtered dogs for consumption or commercial purposes. Thirty-five (53%) of the dog owners extensively managed their dogs by allowing them to fend on their own for sustenance; whereas, twenty-one (32%) and ten (15%) practiced the semi-intensive and intensive management systems respectively.

Eleven (17%) of the respondents knew about Rabies disease and only six (9%) could describe the typical signs of Canine Rabies. Only seven (11%) of the dog owners confirmed they had recorded Canine Rabies amongst their dogs in the past.

Rabies cases and management

Only 6 (43%) out of the 14 respondents who had seen cases of rabid dogs in the past had reported to the designated veterinary authorities for necessary control action.

Out of these 14 respondents, nine (14%) of the dog owners had no idea what happened to their dogs after they had shown symptoms of rabies; three (2%) died on their own and the remaining two (1.3%) were killed by the owners. From all the fourteen retrospective Rabies cases, nine dogs and five humans sustained dog-bite injury. Four (80%) of the five human victims of dog bite were confirmed to have received post-exposure treatment

Prevention/vaccination against Rabies

Only sixteen (24%) of the dog owners knew about vaccination of dogs against Canine Rabies and only three (5%) of them had record of previous vaccination of their dogs against Rabies. None of the respondents had up to date record of vaccination against Rabies for their dogs.

Risk factors of Rabies incidence in Zamfara State

The type of management system adopted to provide care and sustenance for the dogs and the level of knowledge of Rabies and its prevention by the dog owners were identified in the study as the risk factors of Rabies occurrence in Zamfara State (Table III).

TABLE III: Risk factors and their measure of influence on Rabies incidence in Zamfara State

Risk factors	Relative Risk	Interpretation
Extensive system of management	1.8	The practice of the extensive system of management increases the risk of Canine Rabies amongst dogs of the State. The risk is increased by 80% in Zamfara State.
Semi-intensive system of management	0.35	The practice of semi-intensive system of management reduces the risk of Canine Rabies by 35% amongst dogs of the State.
Intensive system of management	0.47	Intensive system of management of dogs reduces the risk of the dogs in the State developing Rabies. The risk is reduced by 47% in Zamfara State.
Knowledge about Rabies and how to prevent the disease	1	The level of knowledge of dog owners about Canine Rabies and its prevention at the time of this study does not affect the risk of Canine Rabies amongst dog population in Zamfara State.

DISCUSSION

This study revealed that knowledge of Canine Rabies was very poor (17%). Only 9% of the total respondents were able to describe the clinical signs of the disease in their dogs. This could have been a likely explanation for the low finding in this study that showed that (11%) of the dog owners had recorded Rabies amongst their dogs in the past. This suggests that there was a possibility that even if the dogs had gotten Rabies, they (the owners) may not have known. Furthermore, they could have also likened it to other diseases. The lack of knowledge of the disease could lead to inability to identify the disease leading to lack or reduced Canine Rabies reporting to the relevant authorities. The rabid cases reported to the designated authorities may not be the true situation of the disease occurrence in the State.

The level of knowledge of rabies (17%) amongst the respondents as revealed by results from this study is extremely low when compared to other findings round the globe. In India, a high proportion (96%) of respondents had knowledge of Rabies (Kumar, 2019). Comparable high levels of awareness were also found in Sri Lanka (90%); Bali, Indonesia (97%); and 94% in

the Bohol Province, Philippines (Matibag *et al.*, 2008; Davlin and VonVille, 2012; Widyastuti *et al.*, 2015). The high awareness levels were suggested as a result of the wide dispersion of information of Rabies through the media in those countries (Kumar, 2019). There is thus the need for increase awareness of the disease especially along the One-Health approach to increase knowledge and awareness-raising activities in Zamfara State and hence in Nigeria (Idachaba and Bolajoko, 2018).

The study also revealed that dog owners have low knowledge of rabies vaccination in dogs (24% of respondents), hence low level of vaccination against the disease (5% have records of previous vaccination and none with up-to-date record). This is poor compared to reports of a study in Sri Lanka where 48.1% of the respondents were able to show their pet's vaccination certificate (Matibag *et al.*, 2008). This again emphasizes low level prevention practices in Nigeria compared to other countries. This study also suggests that although the respondents knew about rabies, knowledge was not a guarantee for right prevention practice of up to date vaccination of dogs against the disease.

Hence, there is great and urgent need to improve rabies prevention practices among dog owners in Nigeria.

The study further showed that the most important risk factor was the practice of the extensive system of management which increased the risk of Rabies amongst dogs of the State by 80% (relative risk=1.8) and caused Canine Rabies spread from infected to un-infected dogs. Other management practices such as Semi-intensive system and Intensive system of management did not increase the risk of Rabies spread in Zamfara State. This study also showed that few people (15% of the dog owners) practiced intensive management system while more than half of the respondents (53%) extensively reared their dogs. This is lower than the findings of Bolajoko *et al.*, 2019 in Oyo State, Nigeria. This study confirms the claim that stray dogs played an important role in the transmission of Canine Rabies (Bolajoko *et al.*, 2019). Rabid dogs reared extensively have a high likelihood of infecting other non-rabid dogs that are also reared extensively and hence increase the spread of the disease in the community. Thus, it is important to educate dog owners and all stakeholders on the epidemiology of rabies and on managing the disease in dogs. Perhaps, this is what is lacking and responsible for the finding in this study on why the level of knowledge of dog owners about Canine Rabies and its prevention did not increase or reduce the risk of dogs getting the disease in Zamfara State (relative risk =1). Also, given the fact that Rabies is endemic in Nigeria and the dog population is increasing, this study suggests that more emphasis should be laid on intensive dog rearing as supported by Bolajoko *et al.*, 2019.

From this study we can recommend that relevant authorities should institute leash laws and enforcement agents that would ensure that dog owners never rear dogs extensively. In this light, a system of tracking dogs bought and bred together with their vaccination status is very

essential and should be instituted to track unvaccinated dogs that could possibly be at a higher risk of introduction of the disease. Also, there is a need for enforcement agents to periodically scout the streets and capture roaming dogs that could be kept in specific shelters which the government, private or non-governmental organizations could create to reduce the risk of roaming and the effect of extensive management of dogs. This should be coupled with compulsory vaccination or re-vaccination against Rabies for these captured stray dogs and the culling of diagnosed rabid dogs to prevent the increase of this Public health threat among human population.

CONCLUSION

In conclusion, the knowledge of these risk factors as identified in this study, could be hindrances to eradicating Rabies in Nigeria. Feasible measures discussed in the study when implemented will help to curtail further spread of the disease in animal population as well as in human population in Nigeria.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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