

KNOWLEDGE, ATTITUDE AND PRACTICE OF HUNTERS AND CATTLE HERDERS TOWARDS RABIES IN JIGAWA STATE, NIGERIA

Danladi Yusuf^{1*}, Grace Sabo Kia², Usman Usama Bashir², Jakob K. P. Kwagwa², Bello Mohammed², Saulawa Mahmud Abdullahi³, Gali Abaka Umaru³ and Mohammed Umar Yuguda³

¹*Bauchi State Ministry of Agriculture, Bauchi State, Nigeria.*

²*Department of Veterinary Public Health and Preventive Medicine, Faculty of Veterinary Medicine, Ahmadu Bello University Zaria, Kaduna State, Nigeria.*

³*Department of Veterinary Public Health and Preventive Medicine, Faculty of Veterinary Medicine, Bayero University Kano, Nigeria.*

Corresponding Author E-mail: ibnyusuf09@gmail.com, +2348037316415

Received 15 January 2024; Accepted 27 February 2024; Published 30 March 2024

ABSTRACT: Rabies is a highly lethal virus that can affect both humans and warm-blooded animals. In Africa, dogs are the primary source of human rabies cases, with Nigeria being one of the endemic countries. An effective rabies prevention and control strategy relies on the knowledge, attitude, and practice (KAP) of dog owners regarding the disease. A study was conducted in Jigawa State, Nigeria, to assess the KAP of hunters and cattle herders to inform rabies prevention and control efforts. A cross-sectional study was conducted between July 2021 and November 2022, questionnaires were administered to 295 hunters and cattle herders to assess their KAP regarding rabies. Data were analyzed using descriptive statistics and a Chi-square test at a significance level of $P < 0.05$. The results showed good knowledge and attitude but poor practice scores of the respondents, with scores of 67.5%, 56.3%, and 45.1%, respectively. The study also found a statistically significant association between the respondents' educational status, age, and occupation and their overall categorized KAP scores ($P < 0.005$). In conclusion, the KAP scores of the respondents regarding rabies were suboptimal, which poses a public health threat. Therefore, there is a need for routine awareness campaign to boost public knowledge of rabies in a society.

Keywords: Cattle Herders, Jigawa State, Hunters, Knowledge, Rabies, Vaccination

Citation: Yusuf, D., Kia, G. S., Bashir, U. U., Kwagwa, J. K. P., Mohammed, B., Abdullahi, S. M., Umaru, G. A., and Yuguda, M. U. (2024). KNOWLEDGE, ATTITUDE AND PRACTICE OF HUNTERS AND CATTLE HERDERS TOWARDS RABIES IN JIGAWA STATE, NIGERIA. Direct Research Journal of Veterinary Medicine and Animal Science. Vol. 9(1), Pp. 42-51. <https://doi.org/10.26765/DRJVMAS885912300>. This article is published under the terms of the Creative Commons Attribution License 4.0.

INTRODUCTION

Rabies is a lyssavirus infection that causes acute encephalitis or meningoencephalitis, which is almost usually fatal (Crowcroft and Thampi, 2015). The disease is an ancient zoonosis that poses a public health threat by killing approximately 59,000 people each year throughout the world (2). Dogs are implicated in (99%) cases of human rabies in Africa (Hampson et al. 2016; Rabies, 2022). The disease is sporadic in Nigeria with a 100% case

fatality rate. Any warm-blooded species, including humans, is susceptible to contracting the virus and passing it on to other animal or people; nonetheless, dogs are the animals most frequently affected (Onyemocho et al., 2020). Dog flesh is seen as delectable and is consumed by various Nigerian societies, posing an overwhelming public health danger to individuals who handle and consume dog meat, which may expose them to the rabies virus (Otolorin et al., 2014; Kia et al., 2018).

Furthermore, hunters and cattle herders utilise dogs for hunting and herding respectively which if exposed to rabies pose a dangerous threat to the dog owners as well as the community. The public health consequences of dog transportation, dog butchering, and unprotected dog handling is of importance (Mohammed, 2019), the number of people involved in such activities demonstrate how susceptible a community is to rabies exposure (Ekanem et al., 2022). Dog vaccination, on the other hand, can assist lower or remove the human rabies burden in locations where dogs remain the primary source of rabies infection. Vaccines serve to prevent rabies from spreading to humans and other animals by providing pre-exposure immunity and preventing individual animals from contracting the disease (Berndtsson et al., 2011). The lack of community awareness and information about canine rabies has hampered the goal of zero deaths from dog-mediated human rabies. Routine rabies vaccination of dogs is not widely practiced in Nigeria and most African nations (Gbeminiyi et al., 2015). Studies on rabies knowledge, attitude, and practice (KAP) among the public and dog owners have been conducted in some parts of the country, with promising results regarding rabies control in Nigeria (Christopher, 2017, Opaleye et al. 2006). Although, information on rabies in Jigawa State is unavailable in the literatures, this toughens public health decision making on the control of rabies in the State. This study will therefore inform stakeholders within and outside Jigawa State about rabies and inform policy makers regarding intervention plans. The study will also provide base line information for further research, development of sustainable rabies control program and assessment of other public health risk associated with rabies. This study was to assess the knowledge, attitude, and practice of rabies among hunters and cattle herders in Jigawa State, Nigeria, to inform rabies control and prevention.

MATERIALS AND METHODS

Study area

Jigawa State is in the north-western geopolitical zone of Nigeria and has twenty-seven local government areas (Figure 1). These include: Auyo, Babura, Birniwa, Birnin Kudu, Buji, Dutse, Gagarawa, Garki, Gumel, Guri, Gwaram, Gwiwa, Hadejia, Jahun, Kafin Hausa, Kaugama, Kazaure, Kiri Kasamma, Kiyawa, Mai Gatari, Malam Madori, Miga, Ringim, Roni, Sule Tankarkar, Taura and Yankwashi. Kano State and Katsina State border Jigawa to the west, Bauchi State to the east, and Yobe State to the northeast. Jigawa shares an international boundary with the Republic of Niger to the north. Most of the population live in rural areas. The State is divided into three senatorial zones: Jigawa North-West, Jigawa North-East, and Jigawa South-West (Jigawa State Government, 2017).

The State was ranked number eighth most populous States in Nigeria, with a population of 7,499,100 (2022 Projection), residents of Jigawa State are predominantly of Hausa and Fulani background. Thus, farming and animals' husbandry remains a major (80% of the population) aspect of their economic activities (Jigawa State Government, 2017; Jigawa State Government, 2023). There are two major religions in the state (Islam and Christianity), most (99%) of the residents practice Islam as their religion; and Jigawa State is one of the twelve states in the country to be governed by Sharia law (WikiLoves Earth, 2023).

Hunters' council of Nigeria Jigawa State chapter has shown that Jigawa state has an estimated hunter of 2,423 members (Hunters' Council of Nigeria Jigawa State Chapter, 2023). Hunters often use dogs to track and retrieve game animals, such as birds, rabbits, or deer. Depending on the type of hunting and the terrain, different breeds of dogs may be used. Cattle herders association do exist in Jigawa state, but the estimated number of the members of the association is not available or documented. Cattle herders commonly use dogs to help them manage their livestock. Similarly, there is no available information regarding the estimated number of dogs in Jigawa state.

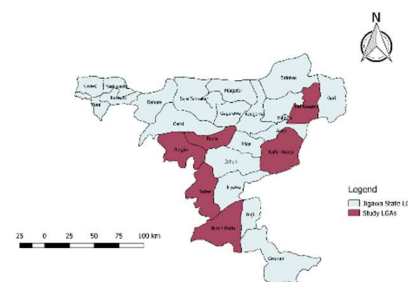


Figure 1: Map of Jigawa State Showing the Local Government Areas (LGAs) of the Study

Study design

This is a community-based cross-sectional study, conducted between July 2021 and November 2022.

Study population

The study population includes hunters and cattle herders in six LGAs in Jigawa State.

Inclusion criteria

The inclusion criteria for this study are as follows:

1. Hunters and cattle herders who belong to their respective associations at the time of the study.
2. Hunters and cattle herders who are willing to participate in the study.

Exclusion criteria

1. Hunters and cattle herders who are not staying in Jigawa State.

Sample Size Determination

The sample size formula $[n = Z_{1-\alpha/2}^2 p(1-p)/d^2]$ (Charan and Biswas, 2013) was used in determining sample size of the respondents.

Where:

n = Minimum sample size

$Z = 1.96$ standard normal deviate for desired confidence interval (95%).

P = estimated proportion of population having knowledge about rabies (74%) as reported by Edukugho *et al.* (2018) was used. Since no KAP study about rabies was conducted in Jigawa state.

$Q = 1 - P$

d = Desired Absolute Precision (5 %)

$n = 1.96^2 \times 0.74(0.26) / (0.05^2) = 295.64936$

considering the non-response rate of 10%

$n = 295.64936 + 29.565 = 325.21436$

Therefore, $n = 325$

Sampling method

Recruitment of respondents (Hunters and Cattle Herders)

Snowball sampling methods was employed in the recruitment of the respondents. The technique was selected due to the inherent challenges in identifying and accessing these individuals (hunters and cattle herders) within the community. This technique involved utilizing existing contacts and social networks of known hunters and cattle herders, starting with their leaders, who provided referrals to identify and interview additional participants sharing similar characteristics. As a result of this approach, a total of 295 participants were successfully interviewed for the study.

Study instrument

A semi-structured, close ended questionnaire adopted from previous studies (Al-mustapha, year missing) was used to collect the data. Open Data Kit (ODK) management tool was used in data collection to ease data management. Basic data relating to demography such as age, gender, educational level, and occupation was captured. Furthermore, the knowledge, attitude, and practice of the study participants as it pertained to rabies were also contained in the questionnaire. These include

questions on the mode of transmission, clinical symptoms, and preventive measures. There were four key sections to the questionnaire. The first section consists of 7 questions that were about the socio demography of the respondents. The second section was about knowledge, with 13 questions. The third and fourth sections were about attitude and practices with 10 and 6 questions, respectively.

Ethical consideration

Ethical approval was obtained from the Ethical Committee of Jigawa State Ministry of Agriculture and Natural Resources (Veterinary Department) with a code number; NRS/PER-332/V. Participants informed consent was obtained and respondents were assured that the information provided will be kept confidential.

Data management and analysis

Microsoft Excel (2016) and IBM SPSS version 26 were used in data cleaning and analysis. Univariate analysis was conducted to obtain frequencies and proportions of some variables. Bivariate analysis was used to determine the relationship between categorical variables. Results were presented in tables and charts.

Independent Variables for the Hunters and Cattle Herders

1. Age
2. Sex
3. Religion
4. Occupation
5. Educational status

Dependent Variables

1. KAP of hunters and cattle herders

Statistical Analyses

Univariate analysis was conducted to obtain frequencies, proportions, Mean, standard deviation, minimum, maximum, and median values of some variables. The association between the dependent variable and independent variables was analysed using a Chi-Square (χ^2) analysis at a 95% confidence interval; a P-value less than 0.05 were considered significant. Each accurate response was awarded one point, while each incorrect response received a score of zero. The mean scores for knowledge, attitude, and practice were calculated; respondents with knowledge, attitude, and practice scores that were equal to or higher than the mean scores were considered to have good knowledge, attitude, and practice, while those with scores that fall below the mean

were classified as having poor knowledge, attitude and practice (Ameh et al., 2014). The associations between demographic variables and categorized KAP scores were evaluated using the χ^2 test of the association at 95% confidence levels. P values less than 0.05 were considered significant in the χ^2 analysis.

RESULTS

Socio-demographic characteristics of hunters and cattle herders, Jigawa State

A total of 295 hunters and cattle herders were interviewed on Knowledge, Attitude and Practice about rabies. The mean (SD) age of the respondents was 32±10 years. The respondents' age group 15-24 years are 57 (19.3%), 25-34 years are 148 (50.2%), 35-44 years are 59 (20%), and >44 years are 31 (10.5%). Majority of the respondents were males 291 (98.6%) and practice Islamic religion 292 (99%). More than half 220 (74.6%) of the respondents reside in rural settings. Regarding the level of education, 61 (20.7%) attended primary school, 96 (32.5%) attended secondary school, 33 (11.2%) attended tertiary institutions, 102 (34.6%) attended non-formal education, and others are 3 (1%). Concerning occupation, 75 (25.4%) are businessmen, 158 (53.6%) are farmers, 15 (5.1%) are civil servants, and 47 (15.9%) are other businesses (Tables 1 and 2). In this study, 277 (93.9%) of the respondents knew that rabies affects both humans and animals, 278 (94.4%) knew that transmission is through the bite of a rabid dog. Similarly, 266 (90.2%) of the respondents knew that a dog is a primary host for rabies virus in Nigeria and biting objects and humans is an indication of a rabid dog.

About 246 (83%) of the respondent knew rabies is fatal, while 164 (55.6%) knew rabies cannot be cured once symptoms appear, and 243 (82.45%) were aware rabies can be prevented through vaccination. More than half of the respondents 185 (62.7% %) don't know that the head of an animal suspected to have rabies should be submitted to the veterinarian. Regarding rabies control, 162 (54.9%) were aware that dog registration and licensing helps in control of rabies, wandering increases the likelihood of dog rabies was known by 223 (75.6%) of the respondents (Table 2).

Of all the respondents, 250 (84.7%) agreed that bite by suspected animal should be reported to the doctor, and 233 (79%) agreed that all dogs should be vaccinated against rabies, whereas 182 (61.7%) disagreed that rabies is of little importance to humans. However, only 135 (45.8%) of the participants agreed that mad dog should be killed and beheaded, and head taken to a veterinarian and 155 (52.5%) agreed that washing bite wounds with soap and water before seeking medical care is important (Table 3).

Practice of Hunters and Cattle Herders related to Rabies, Jigawa State

Of the 295 respondents, 112 (38%) do vaccinate their dogs against rabies and just 76 (25.8%) keep records for their dogs. About 171 (58%) said that they take their dogs to the veterinary clinic when they are sick and 225 (76.3%) of the participants do allow their dogs to roam freely (Table 4). Overall Scores for Knowledge, Attitude and Practice toward Rabies Amongst Hunters and Cattle Herders, Jigawa State. Of the 295 respondents, 199 (67.5%) had strong understanding about rabies, while positive attitudes toward rabies prevention were found in 166 (56.3%) of the respondents, whereas 162 (54.9%) of the respondents showed poor rabies prevention practices (Table 5). Association between KAP Scores about Rabies and Some Key Independent Variables among Study Respondents of Jigawa State,

The scores for KAP were pooled together, and the mean score was used to get the cumulative KAPs the respondents. Respondents with a score greater than or equal to the mean (Mean=19.33, SD=4.881) were classified as having a good KAP level, while those with a score less than the mean were classified as having a poor KAP level. The result showed that 185 (62.7%) of the study participants had good KAP concerning rabies, whereas 110 (37.3%) had a poor KAP level. The Association between independent variables and KAP scores on rabies was calculated using Pearson's Chi-square. The result showed that there was a significant association between KAP scores and age ($\chi^2= 8.169$, $p<0.043$), KAP scores and occupation ($\chi^2= 17.236$, $p<0.001$), and KAP scores and educational status ($\chi^2= 15.19$, $p<0.04$). However, there was no statistically significant association between sex, religion, area of residence, and the group of participants (Table 6).

DISCUSSION

This study assessed the knowledge, attitude and practice of hunters and cattle herders towards rabies in Jigawa State, Nigeria. The knowledge of rabies among respondents showed 67.5% good knowledge. Almost all respondents showed adequate knowledge of the main host of rabies, its deadly nature, the signs seen in rabid dogs, and its prevention by vaccination. Similarly, larger proportion of the respondents indicated high level of knowledge regarding risk of dog meat processing and consumption. These facts and others like increased risk of rabies in stray dogs and friendly dogs acting aggressively out of the sense could be rabid are known largely to studies carried out in various places (Atsipoftrtd et al., 2016; 24). It is well known that allowing dogs to wander freely would accelerate the spread of rabies in human and animals.

Table 1: Socio-Demographic Characteristics of Hunters and Cattle Herders in Jigawa State.

Demographic Characteristics	Total number (n=295)	Percentages (%)
Age (Years)		
15-24	57	19.3
25-34	148	50.2
35-44	59	20
>44	31	10.5
Sex		
Male	291	98.6
Female	4	1.4
Residential Setting		
Rural	220	74.6
Urban	75	25.4
Religion		
Islam	292	99
Christianity	3	1
Others	0	0
Level of Education		
Primary school	61	20.7
Secondary school	96	32.5
Tertiary	33	11.2
Non-Formal Education	102	34.6
Others	3	1
Occupation		
Businessman	75	25.4
Civil servant	15	5.1
Farmer	158	53.6
Others	47	15.9

Table 2: Knowledge of hunters and cattle herders in Jigawa state.

Rabies knowledge	Responses	Frequencies (n=295)	Percentages (%)
Rabies can affect both Humans and animals	Yes	277	93.9
	No	18	6.1
Rabies virus can be transmitted through the bite of rabid animal	Yes	278	94.2
	No	17	5.8
Dog is the main host for rabies virus in Nigeria	Yes	266	90.2
	No	29	9.8
Biting of objects and people are signs observe in a rabid dog	Yes	266	90.2
	No	29	9.8
Is rabies fatal?	Yes	246	83.4
	No	49	16.6
Can rabies be cured once symptoms begin to manifest?	Yes	131	44.4
	No	164	55.6
Can rabies be prevented by vaccination	Yes	243	82.4
	No	52	17.6
Do you know that the head of an animal suspected to have rabies should be submitted to the veterinarian?	Yes	110	37.3
	No	185	62.7
Dog registration and licensing helps in control of rabies	Yes	162	54.9
	No	133	45.1
Dog meat processors are more at risk of being infected with rabies virus	Yes	232	78.6
	No	63	21.4
A mad dog should not be slaughtered for human consumption	Yes	132	44.7
	No	163	55.3
Wandering increases the likelihood of dog rabies	Yes	223	75.6
	No	72	24.4
Friendly dog suddenly turned aggressive may be rabid	Yes	261	88.5
	No	34	11.5

Attitude of the Hunters and Cattle Herders related to Rabies, Jigawa State

The attitudes toward rabies prevention among respondents showed 56.3% good attitudes. More than 80% of the respondents agreed that dog bites should be reported to a doctor, 79% agreed that all dogs should be vaccinated and 81.7% agreed that children must not play with stray dogs. These findings indicate good attitude

toward rabies prevention by the respondents. These findings agreed with those in Federal Capital Territory, Nigeria, where most of the respondents reported that in the event of a dog bite, they would notify the proper authorities and all dogs should be vaccinated (Edukugho et al., 2018). Another study conducted in Sri Lanka agreed with these

Table 3: Attitudes of Hunters and Cattle Herders in Jigawa state.

Attitudes toward rabies	Response	Frequency	Percentage(%)
Bite by suspected animal should be reported to the doctor	Agree	250	84.7
	Disagree	29	9.8
	Indifferent	16	5.4
Rabies is of little importance to humans	Agree	86	29.2
	Disagree	182	61.7
	Indifferent	27	9.2
All dogs should be vaccinated against rabies	Agree	233	79
	Disagree	33	11.2
	Indifferent	29	9.8
Vaccinating dogs yearly is not necessary	Agree	116	39.3
	Disagree	123	41.7
	Indifferent	56	19
It is wrong to allow dogs to roam	Agree	195	66.1
	Disagree	74	25.1
	Indifferent	26	8.8
Children must not play with stray animals	Agree	241	81.7
	Disagree	38	12.9
	Indifferent	16	5.4
Washing bite wounds with soap and water before medical help is necessary	Agree	155	52.5
	Disagree	39	13.2
	Indifferent	101	34.2
People should not come close to mad dog and should let it run away	Agree	218	73.9
	Disagree	58	19.7
	Indifferent	19	6.4
Mad dog should be killed and beheaded and head taking to a veterinarian	Agree	135	45.8
	Disagree	46	15.6
	Indifferent	114	38.6
Mad dog should be killed and bury	Agree	261	88.5
	Disagree	14	4.7
	Indifferent	20	6.8

Table 4: Practice of the Hunter and Cattle Herder as relates to Rabies in Jigawa State.

Practice for rabies	Responses	Frequencies	Percentages (%)
Do you vaccinate your dogs against rabies?	Yes	112	38
	No	183	62
Do you take your dog to veterinary clinic when is sick?	Yes	171	58
	No	124	42
Do you allow your dog roam?	Yes	225	76.3
	No	70	23.7
Do you give your dog a routine Prophylaxis?	Yes	112	38
	No	183	62
Do you seek medical attention in the advent of an animal bite?	Yes	185	62.7
	No	110	37.3
Do you keep records for your dog?	Yes	76	25.8
	No	219	74.2

findings as reported by most of the respondents (Matibag et al., 2007). Less than half of the respondents agreed that mad dogs should be killed and head taken to a veterinarian, and that vaccinating dogs yearly is not necessary. These findings might be related to their

insufficient knowledge about rabies prevention and control. This is because many of the respondents might have no knowledge about submitting head of killed dog to veterinarians and necessary annual dogs' vaccination to maintain antibodies titre. Such misconceptions may result

Table 5: Overall Scores for Knowledge, Attitude and Practice toward Rabies Amongst Hunters and Cattle Herders, Jigawa State.

Scores	Knowledge	Attitudes	Practices
Good	199 (67.5%)	166 (56.3%)	133 (45.1%)
Poor	96 (32.5%)	129 (43.7%)	162 (54.9%)
Total	295 (100%)	295 (100%)	295 (100%)

Table 6: Association between KAP Scores about Rabies and Some Key Independent Variables among Study Respondents of Jigawa state.

Variables	Good (%)	Poor (%)	Test statistic (χ2)	P-value
Age group (Years)				
15-24	27 (47.4)	30 (52.6)	8.169	0.043*
25-34	100(67.6)	48 (32.4)		
35-44	40 (67.8)	19 (32.2)		
45 and above	18 (58.1)	13 (41.9)		
Sex				
Male	183 (62.9)	108 (37.1)	Fisher's	0.597
Female	2 (50)	2 (50)		
Area of Residence				
Rural	134 (60.9)	86 (39.1)	1.203	0.273
Urban	51 (68.0)	24 (32.0)		
Religion				
Islam	183 (62.7)	109 (37.3)	Fisher's	0.887
Christianity	2 (66.7)	1 (33.3)		
Occupation				
Businessman	52 (69.3)	23 (30.7)	17.236	0.001*
Civil servant	11 (73.3)	4 (26.7)		
Farmer	105 (66.5)	53 (33.5)		
Others	17 (36.2)	30 (63.8)		
Educational status				
Primary school	47 (77.0)	14 (23.0)	15.19	0.004*
Secondary school	62 (64.6)	34 (35.4)		
Tertiary	21 (63.6)	12 (36.4)		
Non-Formal Education	55 (54.5)	46 (45.5)		
Others	0 (0)	4 (100)		
Participants				
Hunter	128 (63.7)	73 (36.3)	0.254	0.615
cattle herder	57 (60.6)	37 (39.4)		

*Statistically significance, $P < 0.05$

in many rabies cases going undiagnosed and a large number of dogs having insufficient antibodies to protect them from rabies infection. Hence, all exposed individual needs anti-rabies prophylaxis. These findings agreed with those in Ethiopia, where in most cases, people killed dogs but do not submit the head for diagnosis (Kabeta et al., 2015), and in Nigeria, where less than half of the respondents vaccinate their dogs annually (Edukugho et al., 2018; Kabeta et al., 2015). About 52.5% of the respondents agreed that washing bite wounds with soap and water before seeking medical help is necessary to prevent rabies infection. This attitude may be reflective of the knowledge of the respondents about rabies virus transmission through the bite of a rabid dog. The World Health Organization (WHO) recommended washing bite wounds with soap and water for 15 minutes before medical help as a first-aid measure to reduce the risk of contracting rabies (WHO and OIE (2015). This finding was in line with a study in Nasarawa state which reported that many of the respondents seek post-exposure prophylaxis after a dog

bite (12), and contrast with another study in India in which only 15.5% washed their wounds with soap and water (Singh et al., 2020). Regarding to practice as relates to rabies, the respondents (54.9%) had poor practice. The practice performance was below average, less than expected of the respondents regarding good practice toward rabies. This showed careless dog ownership, which was reflected in the steps taken to stop the rabies spread. Most of the respondents confessed that they do not vaccinate their dogs neither do they seek prophylaxis for their dogs. This indicates how the extend of the vulnerability of their dogs to diseases and risk to the community regarding rabies infection could be. This was unlike a study conducted in Abuja where most dog owners vaccinate and take their dogs to a veterinary clinic for prophylaxis (Edukugho et al., 2018). However, more than half of the respondents seek medical attention in the advent of an animal bite, and only a few keep records of their dogs. This result may be due to less value given to their pets or a knowledge gap about the importance of

record keeping. The early seeking for medical attention could help prevent the risk of getting infected with a disease. Likewise, record keeping help in history taking for planning a program and management of events. This agreed with study in Nigeria where a larger proportion of the respondents seek medical attention in the advent of a dog bite (Edukugho et al., 2018). A similar survey conducted in Ethiopia also stated that a higher proportion of people go to a hospital for treatment when bitten by a dog (Kabeta 2015). However, this is contrary to what was found in India, where many of the people don't seek medical treatment in the hospital. More than 75% of those surveyed say they don't place any boundaries on their dogs' freedom to roam. By allowing dogs to roam freely, rabies could spread more easily among both human and animal populations. This finding is contrary to the result found in Abuja where only 9.8% free their dogs to move without restriction (Edukugho et al., 2018).

The association between KAP scores and demographic characteristics of the respondents showed that there was a statistically significant association between age, occupation, educational status, and KAP scores (P -value < 0.05). This result can be attributed to the differences in frequency and ways of information sharing among communities. Individuals having a basic educational status would likely acquire information faster and more often than those without any educational qualification. Similarly, older age group might have more experience about rabies compared to younger ones. However, majority of respondents with primary school education levels, civil servant, and aged above thirty-five had good KAP scores. These findings agreed with study in Nigeria (14,22) and Ethiopia (Alie et al., 2015). Another study showed that there was a strong association between age, educational level, and a good degree of awareness regarding rabies (20). Another Ethiopian study found a significant association between KAP scores and sex, educational success, and occupation (Chanie et al., 2014). However, according to a different study conducted in Ethiopia, gender and religion were associated with practice scores and were probably caused by variations in animal management practices (Kabeta et al., 2015). This contrasted with what we discovered.

CONCLUSION

In conclusion, this study has shown that the participants' level of KAP about rabies is good (62.7%) in the study area, nevertheless, still there are some KAP gaps in the community regarding the anti-rabies vaccination and prophylaxis practices, and irresponsible dog ownership as many of the participants allow their dogs to roam about. However, there is statistically significant association that exists between age, educational status, and occupation, and KAPs of the respondents.

RECOMMENDATIONS

1. The ministry of agriculture and natural resources, in coordination with the directors of veterinary hospitals, should promote and enforce responsible dog ownership by requiring canines to receive consistent annual vaccinations.
2. Jigawa state veterinary services should provide periodic education to raise community knowledge on rabies and provide accurate information targeted to hunters and cattle herders dog owners.
3. The stakeholders should promote rabies research across the state to identify undiscovered instances to advance rabies eradication.

REFERENCES

- Alie A, Assefa A, Derso S, Ayele B. (2015). Assessment of knowledge, attitude, and practice on rabies in and around Debreabor, South Gondar, Northwest Ethiopia. 2015 [cited 2023 Feb 11]; Available from: <https://www.researchgate.net/profile/Birhanu-Ameh>
- Ameh V.O, Dzikwi A.A, Umoh J.U. (2014). Assessment of Knowledge, Attitude and Practice of Dog Owners to Canine Rabies in Wukari Metropolis, Taraba State Nigeria. *Global Journal of Health Science* [Internet]. 2014 Sep 1 [cited 2022 Aug 23];6(5):226.
- Atsipotrftd, O. F., O.F. Mosiae, B.Y Tuon, Hikufe E.H. (2016). Rabies sero-survey in vaccinated domestic dogs and knowledge assessment of rabies among dog owners, Ohangwena region, Nam. 2016;(April):14–6.
- Berndtsson, L.T, Nyman A.K.J, Rivera E, Klingeborn B. (2011). Factors associated with the success of rabies vaccination of dogs in Sweden. *Acta Vet Scand.* 2011;53(1):1–7.
- Chanie M, Guadu T, Shite A, Bogale B, Fentahun T. (2014). Assessment of Knowledge, Attitude and Practices about Rabies and Associated Factors: In the Case of Bahir Dar Town. *Glob Vet.* 2014;13(3):348–54.
- Charan J, Biswas T. (2013). How to Calculate Sample Size for Different Study Designs in Medical Research? *Indian J Psychol Med* [Internet]. 2013 Apr [cited 2023 May 19];35(2):121. Available from: <https://pmc/articles/PMC3775042/>
- Christopher Rine R. (2017). Knowledge, Attitude and Practice of Rabies in and Around Lafia Metropolis, Nigeria. *Central African Journal of Public Health.* 2017;3(3):27.
- Crowcroft N.S, Thampi N. The prevention and management of rabies. *BMJ (Online).* 2015;350 (January 2015).
- Edukugho A.A, Umoh J.U, Diem M, Ajani O, Uba B, Okeke L. (2018). Knowledge, attitudes, and practices towards rabies prevention among residents of Abuja municipal area council, Federal Capital Territory, Nigeria. *PAMJ* 2018; 31:21 [Internet]. 2018 [cited 2021 Dec 25];31(21).
- Ekanem, E.E, Eyong K.I, Philip-Ephraim E.E, Eyong M. E, Adams E. B, Asindi A. A. (2022) Stray dog trade fuelled by dog meat consumption as a risk factor for rabies infection in Calabar, southern Nigeria. *African Health Science* [Internet]. 2013 [cited 2022 Nov 12];13(4):1170.
- Gbeminiyi Richard O, Julius Olaniyi A, Philip Paul M, Veronica Odinya A, Asabe Adamu D, Morenike Atinuke D. (2015). A Review on Human Deaths Associated with Rabies in Nigeria. 2015.
- Hampson K, Coudeville L, Lembo T, Sambo M, Kieffer A, Attlan M. (2016). Estimating the Global Burden of Endemic Canine Rabies. *PLoS Neglected Tropical Disease* [Internet]. Apr, 2016
- Hunters' Council of Nigeria Jigawa State Chapter. facebook.com/groups.2023.
- Jigawa State Government (2017). Jigawa State People and culture. 2017.
- Jigawa State Government (2023). City Population. 2023.
- Kabeta T, Deresa B, Tigre W, Ward MP, Mor SM. (2015). Knowledge, Attitudes and Practices of Animal Bite Victims Attending an Anti-rabies

- Health Center in Jimma Town, Ethiopia. 2015 [cited 2023 Feb 9]; Available from: <http://www.Ju.edu.et>.
- Kabeta T, Deresa B, Tigre W, Ward MP, Mor SM. (2015). Knowledge, Attitudes and Practices of Animal Bite Victims Attending an Anti-rabies Health Center in Jimma Town, Ethiopia. *PLoS Negl Trop Dis* [Internet]. 2015 Jun 26 [cited 2023 Feb 15];9(6). Available from: <https://pubmed.ncbi.nlm.nih.gov/26114573/>
- Kia G.S.N, Huang Y, Zhou M, Zhou Z, Gnanadurai C. W, Leysona C. M, (2018). Molecular characterization of a rabies virus isolated from trade dogs in Plateau State, Nigeria. *Sokoto Journal of Veterinary Sciences*. 2018;16(2):54.
- Kolawole G.O, Umoh J.U, Kia S.N, Dzikwi A. Demographic Factors Influencing the Rabies Antibody Prevalence of Dogs in Federal Capital Territory, Nigeria. *Folia Vet*. 2018 Sep 1;62(3):9–23.
- Matibag GC, Kamigaki T, Kumarasiri PVR, Wijewardana TG, Kalupahana AW, Dissanayake DRA, (2007). Knowledge, attitudes, and practices survey of rabies in a community in Sri Lanka. *Environ Health Prev Med*. 2007 Mar;12(2):84–9.
- Mohammed, S.(2019). Prevalence of rabies antigen in brain tissue of slaughtered dogs and public health factors associated with dog processing in Billiri, Gombe State, Nigeria. *Savannah Veterinary Journal*. 2019;(January):29–35.
- Oluwayelu D.O, Adebisi Al, Ohore O.G.(2015). A survey of rabies virus antibodies in confined, hunting and roaming dogs in Ogun and Oyo States, Southwestern Nigeria. *Asian Pac J Trop Dis*. 2015;5(1):17–21.
- Onyemochi, A, Moses A, Kisani A, Victoria ON, Joseph A Okopi (2020). Assessment of knowledge and practice of vaccination of dogs against rabies by dog owners in Makurdi, Benue State, Nigeria. *Annals of Medical Research and Practice*. 2020;(April).
- Opaleye O.O, Adesiji Y.O, Olowe O.A, Fagbami A.H.(2006). Rabies and antirabies immunization in Southwestern Nigeria: Knowledge, attitude, and practice. *Tropical Doctor* [Internet]. 2006 Apr 1 [cited 2021 Dec 25];36(2):116–7.
- Otolurin, G. R, Umoh J. U, Dzikwi A. A, Anglairs A. E.(2014). Prevalence of Rabies Antigen in Brain Tissue of Dogs Slaughtered for Human Consumption and Evaluation of Vaccination of Dogs Against Rabies in Aba, Abia State Nigeria. 2014;3(1):5–10.
- Rabies [Internet]. [cited 2022 Nov 11]. Available from: <https://www.who.int/news-room/fact-sheets/detail/rabies>
- Singh T, Mahajan S, Dahiya N.(2020). A cross-sectional study of awareness and practices regarding animal bites in rural community, North India. *J Family Med Prim Care* [Internet]. 2020 [cited 2023 Feb 9];9(6):2751. Available from: <https://pubmed.ncbi.nlm.nih.gov/32984120/>
- Tiwari H.K, Vanak A.T, O'Dea M, Robertson ID.(2019). Knowledge, attitudes, and practices (KAP) towards rabies and free-roaming dogs (FRD) in Shirsuphal village in western India: A community based cross-sectional study. *PLoS Negl Trop Dis*. 2019;13(1).
- WHO and OIE (2015). Global Elimination of Dog-Mediated Human Rabies. Global conference. 2015; (December).
- WikiLoves Earth (2023) in Nigeria. Jigawa State. In https://en.wikipedia.org/wiki/Jigawa_State#Location; 2023.

APPENDIXES

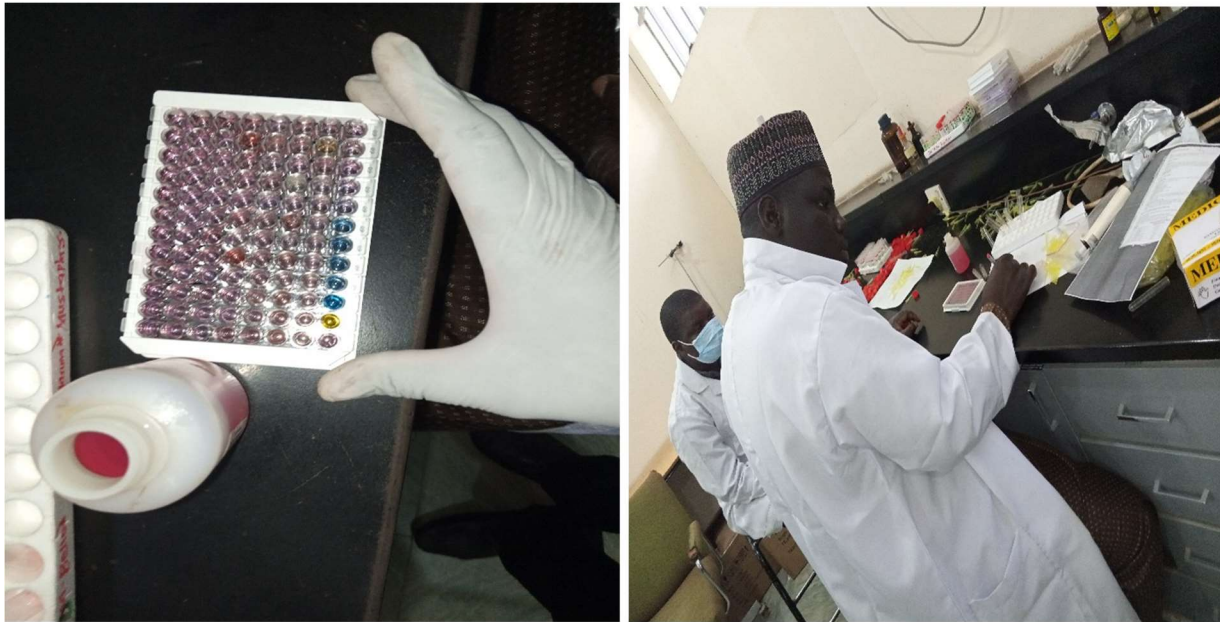


Figure a: During laboratory analysis with labororian at A.B.U. public health laboratory



Figure b: During blood sample collection at Ringim LGA