



Original Article

## Assessment of knowledge and practice of vaccination of dogs against rabies by dog owners in Makurdi, Benue State, Nigeria

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### ABSTRACT

**Objective:** Rabies, one of the oldest and fatal infectious diseases known to human race, is transmitted by infected dogs. The global target of zero dog-mediated rabies human deaths has been set for 2030; however, the realization of this goal poses challenges in most low-income countries where rabies is endemic due to weak surveillance. Dogs have been increasingly deployed for domestic uses over the years, especially for security purposes. This study assessed the assessment of knowledge and practice of vaccination of dogs against rabies by dog owners.

**Materials and Methods:** A cross-sectional community-based study was employed to study 400 dog owners in Makurdi metropolis through multistage sampling techniques. Sighting of valid dog vaccination card was used as criteria for current vaccination. Bivariate analysis was carried out to establish the relationship between the respondent knowledge of rabies and dog vaccination with significant value set at  $P < 0.05$ .

**Results:** The mean age of the respondents was 31 ( $\bar{A} \pm 0.8$ ) years, majority of them had tertiary and secondary education (40.0% and 39.0%, respectively), 26.0% were traders, and 50.0% were married. Overall, 73.0% of the respondents had good knowledge score, 61.0% had seen at least a rabid dog in their life time, and 74.0% have a history of dog vaccination, but evidence of up to date vaccination of dogs by owners was seen in only 18.0% of all the vaccination cards sighted. The relationship between the educational status of the respondents, their knowledge score, and their dog vaccination was statistically significant ( $P < 0.05$ ).

**Conclusion:** Knowledge of rabies among dog owners in Makurdi was good, but the practice of dog vaccination was poor. Educational status was a good predictor of practice. Awareness campaign on dog vaccination should be strengthened and adequate measures should be put in place at the veterinary hospitals in Makurdi for vaccination of dogs.

**Keywords:** Benue Nigeria, Dogs, Rabies, Practice, Vaccination

### INTRODUCTION

Rabies is one of the oldest infectious diseases known to human race, and it is still a disease of public health importance.<sup>[1,2]</sup> The rabies virus which causes the disease is mainly contained in the saliva of animals, but tears, urine, serum, and other body fluids may be infectious as well.<sup>[3]</sup> Any warm blooded animal, including humans, may become infected with the virus and transmit

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it to other animals or humans; however, dogs are the most commonly affected animal, and 99% of human cases are transmitted through dog bites.<sup>[2]</sup> Human rabies is responsible for about 60,000 human deaths annually and most of these deaths are in rural communities in Africa and Asia with nearly half of the victims been children under the age of 15 years.<sup>[1,2]</sup> The unfortunate thing is that many of these lives can be saved if bite victims and health-care providers know what to do and have what they need (rabies vaccine and immunoglobulin).<sup>[4]</sup>

In Nigeria, reports on human death due to rabies infection are low as a result of underreporting, cultural beliefs, poor or inadequate rabies diagnostic units, and poor knowledge of the mode of transmission and prevention of the disease.<sup>[5]</sup> This has led to the disease being neglected by relevant health-care facilities and subsequently poor assistance from international community and donor agencies.<sup>[6]</sup> Routine vaccination of dogs against rabies in Nigeria and most African countries population is also low.<sup>[5-7]</sup> Dog, outside been a major companion or pet animal in Nigeria households, is kept for various reasons ranging from security, breeding business, sports, and recreation to hunting as well as source of meat. Among these reasons, security has gained more ground in recent time due to high incidence of insurgency and security challenges in the neighborhoods.<sup>[8-10]</sup>

In 2015, the World Health Organization (WHO) in collaboration with Food and Agriculture Organization, International Organization for Animal Health and the Global Alliance for Rabies Control came up with a global strategy termed “United Against Rabies.” The strategy was aimed at achieving zero human rabies deaths by 2030 through awareness campaigns, access to timely and affordable post-exposure prophylaxis, and mass dog vaccination.<sup>[2]</sup> Despite the advocacy, realizing this goal is challenging by existing weak surveillance in most low-income countries where rabies is found.<sup>[9,11]</sup> Our study assessed the knowledge and practice of vaccination of dogs against rabies by dog owners in Makurdi, Benue State, Nigeria.

## MATERIALS AND METHODS

### Study area

Benue is one of the 36 states located in the North-central geo-political zone of Nigeria. The state has 23 local government areas with an estimated population of 5,577,415 (projected from 2006 National Census). It shares boundaries with Nasarawa State in the north, Taraba in the east, Cross Rivers State in the south and Ebonyi State, and in the west with Enugu and Kogi States, respectively. The state also shares a common boundary with the Republic of Cameroun on the southeast. Makurdi is the state capital and also the

headquarters of Makurdi Local Government Area. Makurdi has 10 council wards and 10 registered veterinary practicing premises, out of which 3 are government owned while the remaining are privately owned. Health facilities owned by government and privately owned are spread across the Area Council. These are managed by registered veterinary and health professionals who can adequately respond to and manage cases of dog bites.

### Study design

This was a community-based cross-sectional study.

### Study population

The study population were all dog owners in Makurdi metropolis. Those who are <18 years as at the time of the study and those whose dog ownership (irrespective of the age of the dog) was less than a year were excluded from the study.

### Sample size determination

With the WHO dog targeted immunization uptake of 70.0%,<sup>[2]</sup> and 5% degree of precision at 95% confidence interval, a minimum sample size of 322.6 was arrived at using the formula  $[n = Z^2p(1-p)/d^2]$ .<sup>[12]</sup> Considering a non-response rate of 10%, the calculated sample size was adjusted to 358.6 and later rounded up to 400 to increase the power of the study.

### Sampling technique

Multistage sampling technique was used. In the 1<sup>st</sup> stage, five wards (Walamayo, Ankpa, and Modern Market) were selected out of the 10 by balloting. In the 2<sup>nd</sup> stage, two communities were selected in each of the selected council wards making a total of 10 by simple random technique. In the third stage, 40 households were selected from each of the settlements to arrive at the minimum sample size. The selected communities were mapped and the list of all households with dogs was compiled and used as the sampling frame. In a situation, where a household has two eligible respondents, only one was selected by toss of coin.

### Data collection

This study was conducted between April 10 and 17, 2019, through the administration of structured interviewer administered questionnaire and the dog immunization card. Information obtained from the questionnaire were sociodemographic data of the respondents, knowledge of rabies, access to vaccination sites, and the practice of dog vaccination. Among those who claimed to have vaccinated their dogs, the vaccination cards were sighted and necessary details were extracted.

### Data analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS version 23.0) software and presented as tables and charts. All related questions on knowledge were awarded 1 mark for any correct answer and 0 mark for all wrong answers. The total was summed up and the percentage score were graded as reported in a previous study.<sup>[13]</sup> Chi-square ( $\chi^2$ ) was used as the statistical test of significance between knowledge or rabies and uptake of rabies vaccination and *P*-value was set at 0.05.

### Ethical consideration

Ethical approval for the study was obtained from the Ethical Committee of Benue University Hospital, Makurdi, before the study was conducted. An informed written consent was also obtained from the ward heads and the respondents.

## RESULTS

### Sociodemographic characteristics

Table 1 presents the sociodemographic characteristics of the respondents and the dogs. Majority (27.0%) of them were 30–39 years followed by those who were between 20 and 29 years (23.0%), with the mean age of 31 ( $\pm 0.8$ ) years. Slightly above one-third (34.0%) were civil servants, 26.0% were traders, and 20.0% were unemployed. Majority of them had tertiary and secondary education (40.0% and 39.0%, respectively); 50.0% were married, 44.0% were singles, and 99.0% were Christians.

### Awareness of rabies

Almost all (99.0%) the respondents have ever heard of rabies and the predominant source of information was television (21.3%), followed by friends (58.0%), health talks (56.0%), radio (55.0%), and internet (33.0%). The least source of information was veterinary hospitals (24.0%) [Figure 1].

### Knowledge of rabies

Above two-third (75.0%) of the respondents knew rabies to be a viral disease, while some considered it to be a bacterial or fungi infection (12.0% and 8.0%) and 4.0% were indifferent. Majority (60.7%) of the respondents stated that rabies is transmitted through bite by rabid dog, while 24.7% and 12.3% cited cat bite and contact with infected body fluids as the mode of transmission. Most of the respondents had good overall knowledge score (73.0%), followed by fair, poor (8.0%), and excellent (5.0%) knowledge [Table 2].

### History of cases of rabid dog

Table 3 presents history of rabid dog bit, treatment sought for, and outcome. About 61% of the dogs had features of rabies,

**Table 1:** Sociodemographic characteristics of respondents and the dogs (*n*=100).

Variables	Frequency	Percent
<b>Dog owners</b>		
Age (years)		
10–19	48	12.0
20–29	92	23.0
30–39	108	27.0
40–49	76	19.0
50–59	52	13.0
≥60	24	6.0
Mean age=31 years, (SD±4.8 years)		
Educational status		
No formal education	44	11.0
Primary	40	10.0
Secondary	156	39.0
Tertiary	160	40.0
Occupation		
Civil servant	120	30.0
Trader	104	26.0
Unemployed	80	20.0
Students	72	18.0
Farmer	24	6.0
Religion		
Christianity	352	88.0
Islam	48	12.0
Marital status		
Married	200	50
Single	176	44
Widowed	16	4.0
Divorced	8	2.0
<b>Dogs</b>		
Age (years)		
<1	48	12.0
1–4	264	66.0
>4	88	22.0
Mean age		
Sex		
Male	256	64.0
Female	144	36.0
Function of the dogs		
Security	208	71.0
Pet	107	28.8
Breeding	9	2.2

**Table 2:** Distribution of respondents knowledge of the source of infection of rabies.

Knowledge score	Frequency	Percent
Poor	32	8.0
Fair	60	15.0
Good	292	73.0
Excellent	16	4.0

of which 28.0% were dogs owned by the respondents and 33.0% were dogs from the neighborhood. Of the rabid dogs,

**Table 3:** Summary of history of dog bite, management, and outcome.

Variables	Frequency	Percent
Rabid dog/owner		
Household dog rabid	132	28.0
Neighbors dog rabid	112	33.0
No history of rabies	156	39.0
What happened to the rabid dog (n=244)		
Killed	122	50.0
Died	52	21.3
Sold	44	18.0
Disappeared	20	10.7
Family member bitten by dog (n=244)		
Yes	100	41.0
No	144	59.0
Type of treatment to south (n=100)		
Hospital	70	70.0
Traditionalist	15	15.0
Prayer house	10	10.0
No treatment	5	5.0
Treatment outcome (n=100)		
Healthy	56	56.0
Died	15	15.0
Unknown	29	29.0

50.0% were later killed by the owners, 21.3% died naturally, 18.0% were sold, and 10.7% disappeared from the house. Of the bite victims, 70.0% were taken to hospitals, 15.0% to traditionalist, 10.0% to prayer house, and 5.0% received no treatment; 56.0% recovered and 15.0% died.

### Vaccination status of the dogs

History of dog vaccination was 74.0%, but the current vaccination coverage was 18.0%.

Among the dogs ever vaccinated, 43.2% had the vaccination in the first 3 months of age, while the rest were vaccinated within the first 1 month, 6 months, or 1 year (18.9%, 32.4%, and 5.4%, respectively). Frequency of vaccination was either yearly (93.2%) or biennially (6.8%) [Table 4].

### Relationship between dog owners and dogs vaccination

Among the respondents who have ever vaccinated their dogs, those between 30 and 39 years, married and traders constitute the highest (27.0%, 51.4%, and 29.7%, respectively). Similarly, the respondents who attained secondary and tertiary education and those who had good knowledge score immunized their dogs more (51.4%, 44.6%, and 83.8%, respectively). The relationship between the educational status of the respondents, their knowledge score, and practice of dog vaccination was statistically significant ( $P < 0.05$ ), but the relationship between the age, occupation status, marital status of respondent, and practice of dog vaccination was not statistically significant ( $P > 0.05$ ) [Table 5].

**Table 4:** Dog vaccination.

Variables	Frequency	Percent
Ever vaccinated dog (n=400)		
Yes	296	74.0
No	104	26.0
Age at first vaccination (n=296)		
1 <sup>st</sup> month	56	18.9
3 <sup>rd</sup> month	128	43.2
6 <sup>th</sup> month	96	32.4
1 year	16	5.4
How often were they vaccinated (n=296)		
Yearly	276	93.2
Biennially	20	6.8
Presently vaccinated (n=100)		
Yes	72	18.0
No	328	82.0

## DISCUSSION

The sociodemographic characteristics of the dog owners and the dog population in our study are consistent with findings reported in other studies.<sup>[5,7,8,9]</sup> Majority of the dogs are males and aged between 1 and 5 years. These findings with other sociodemographic variables may be due to the belief that male dogs make better guards and hunters and also female dogs attract a lot of male dogs to the house during their mating periods.<sup>[14,15]</sup> Furthermore, majority of the dog owners in our study are literate. The high literacy level of the dog owners agrees with finding that those who are gainfully employed either as civil servants or as traders tend to own dogs more than those who are not employed and not educated.<sup>[16]</sup>

Regarding knowledge, this study shows that 90.0% of the dog owners are aware of rabies and the predominant source of information was television. Health talk and lectures at health facility level were still low (8.4%) [Figure 1]. In addition to the awareness, the dog owners had good understanding of the causative agent of the disease. However, there was demonstrated level of misunderstanding as some considered fungal (8.0%) and bacteria (12.0%) to be the causes of rabies and a significant proportion of them does not know the features of rabies. By implication, there can be gross inability to recognize early a dog that has contracted rabies for early isolation for observation as recommended, giving room for its spread to humans or other domestic animals either by way of bite, contact with body fluid secretions such as saliva and urine. The misconception may probably be due to those who are not educated.

The study showed low vaccination coverage (18.0%) against rabies. The vaccination rate is far below  $\geq 70.0\%$  recommended by the WHO and figure reported for Tanzania,<sup>[2,11]</sup> but far higher than 7.0% reported for Bouake,

**Table 5:** Sociodemographic characteristics of respondents by practice of dog vaccination.

Variables	History of dog immunization		Total (n=100)	Statistical value
	Yes (n=74)	No (n=26)		
	Freq. (%)	Freq. (%)	Freq. (%)	
Age (years)				
10–19	9 (12.2)	3 (11.5)	12 (12.0)	$\chi^2=0.5718$ df=5 P=0.9893*
20–29	16 (22.6)	7 (26.9)	23 (23.0)	
30–39	20 (27.0)	7 (26.9)	27 (27.0)	
40–49	14 (18.9)	5 (19.2)	19 (19.0)	
50–59	10 (13.5)	3 (11.5)	13 (13.0)	
≥60	5 (6.8)	1 (3.8)	6 (6.0)	
Occupation				
Civil servant	20 (27.0)	10 (38.5)	30 (30.0)	$\chi^2=8.459$ df=4 P=0.0761*
Trader	22 (29.7)	4 (15.4)	26 (26.0)	
Unemployed	11 (14.9)	9 (34.6)	20 (20.0)	
Students	16 (21.6)	2 (7.7)	18 (18.0)	
Farmer	5 (6.8)	1 (3.8)	6 (6.0)	
Level of educational				
No formal education	1 (1.4)	10 (38.5)	11 (11.0)	$\chi^2=51.8$ df=3 P=0.0000**
Primary	2 (2.7)	8 (30.8)	10 (10.0)	
Secondary	38 (51.4)	1 (3.8)	39 (39.0)	
Tertiary	33 (44.6)	7 (26.9)	40 (40.0)	
Marital status				
Married	38 (51.4)	12 (46.2)	50 (50.0)	$\chi^2=1.096$ df=3 P=0.7780*
Single	31 (41.9)	13 (50.0)	44 (44.0)	
Widowed	3 (4.1)	1 (3.8)	4 (4.0)	
Divorced	2 (2.7)	0 (0.0)	2 (2.0)	
Knowledge score				
Poor	2 (2.7)	6 (23.1)	8 (8.0)	$\chi^2=20.34$ df=3 P=0.0001**
Fair	7 (9.5)	8 (30.8)	15 (15.0)	
Good	62 (83.8)	11 (42.3)	73 (73.0)	
Excellent	3 (4.1)	1 (3.8)	4 (4.0)	

Cote d'Ivoire.<sup>[17]</sup> The finding in our study is insufficient to control the spread of rabies and also indicative of incorrect information on vaccination. The low vaccination rate explains the persistent endemicity of rabies in our environment.

The opinion of respondents who had knowledge on cases of rabid dog in the study area showed that majority of dog bites seen were caused by dogs within the house and the victims were mostly household members [Table 3]. Other studies have reported similar findings.<sup>[18]</sup> This suggests that circumstances of dog bite or transmission of rabies is not always due to stray dogs; even the owned dogs may be involved in transmission of rabies. Diagnosis of rabies among dogs in our study was based on assumptions. Rabid diagnostic test if made available could mitigate the effect. Furthermore, in our study, 70.0% of dog bite victims sought orthodox medical attention; however, significant proportion prefers non-specific management approaches such as the traditional medication (15.0%) and prayer house (10.0%). This may be one of the reasons behind the death of 15.0% of the victims.

The level of education of the respondents was found to be a great determinant of the tendency to own dogs in Makurdi, as 39.0% of the dog owners had secondary education and 40.0% had tertiary education, while those with primary education made up 10.0% and those with no formal education at all had 2.0%. The relationship between the educational status of the dog owners and the vaccination status of the dogs owned by them was statistically significance.

## CONCLUSION

Despite the high knowledge of rabies among dog owners in Makurdi metropolis, practice of dog vaccination was low. Significant proportion does not know the correct schedules of dog vaccination against rabies. This requires health campaigns and provision of the vaccines at health facilities.

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### Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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