Research article

J. Pub. Health &Tox. Res., 3(4): 426-435 (2026)
DOI: https://doi.org/10.71637/jphtr.vol3no4.81

Knowledge, Attitude and Practice Towards Rabies in Makurdi, Benue State, North Central Nigeria.

***Philomena M. Ikye-Tor[1], Terungwa J. Ikye-Tor[2], Jacob K. Kwaga[3], Grace S. N. Kia[4], Veronica O. Ameh[1], Jarlath U. Umoh[5]**

[1]Department of Veterinary Public Health and Preventive Medicine, Joseph Sarwuan Tarka University, Makurdi, Benue State; [2]Department of Livestock Services, Ministry of Agriculture and Food Security, Makurdi, Benue State [3]Africa Center of Excellence on Neglected Tropical Diseases and Forensic Biotechnology, Ahmadu Bello University, Zaria, Kaduna State; [4]Department of Veterinary Public Health and Preventive Medicine, Ahmadu Bello University, Zaria. Kaduna State; [5]Akwa Ibom State University, Obio Akpa, Akwa Ibom State.

**Corresponding Author Email: ikye-tor.philomena@uam.edu.ng; Tel: +234(0)8037199697*

Article History

Received: 08 Aug 2026
Accepted: 29 Sep 2026
Published: 30 Oct 2026

Abstract

Background: Rabies is a viral zoonotic disease preventable through vaccination, and it is estimated to cause about 59, 000 deaths worldwide. Nigeria has endemic rabies, with roughly 10,000 people exposed to the disease each year through dog bites. This study was carried out to guide planning for effective interventions and control strategies. This study aimed to evaluate the knowledge, attitudes, and practices of Makurdi residents regarding rabies.

Methods: A cross-sectional survey of 378 residents in Makurdi was conducted using structured questionnaires to gather information on their sociodemographic background, as well as their knowledge and attitudes towards rabies prevention. Participants who scored 70% or higher on the knowledge questions were considered to have adequate knowledge. Data were analyzed using Excel and IBM SPSS Statistics, with proportions calculated and associations tested at a 5% significance level.

Results: Out of the 378 participants, only 121 (32%) respondents had sufficient knowledge about rabies prevention. Multivariate regression revealed dog ownership was the only predictor significantly associated with sufficient knowledge of rabies. Respondents who owned dogs had 1.73 higher odds of having adequate knowledge compared to respondents who did not own dogs (95% CI: 1.12 – 2.68; p = 0.013). On the other hand, attitude was satisfactory, with 60.2% of respondents having a good attitude.

Conclusion: Knowledge about rabies was inadequate, with notable gaps in appropriate first aid following dog bites, the assumption that human rabies can be cured, and responsible dog ownership. To reduce the risk of rabies, these gaps should be addressed through public education campaigns and stricter enforcement of laws regulating dog movement.

License: CC BY 4.0[1♦]

Open Access article.

Keywords: Rabies, dog bite, Knowledge, Attitude, Practice

How to cite this paper: *Ikye-Tor et al., (2026). Knowledge, Attitude and Practice Towards Rabies in Makurdi, Benue State, North Central Nigeria. Journal of Public Health and Toxicological Research,* 4(3): 426-435.

1♦This work is published open access under the Creative Commons Attribution License 4.0, which permits free reuse, remix, redistribution and transformation provided due credit is given.

Introduction

Rabies is a severe and typically fatal zoonotic disease of warm-blooded animals that affects the nervous system (WHO, 2018). The primary cause of the disease is the rabies virus of the genus *Lyssavirus* from the family *Rhabdoviridae* (WHO, 2013). The disease is transmitted when an infected animal bites other susceptible hosts. Each year, it is estimated that tens of thousands of people worldwide die from rabies, with the range falling between 25,000 and 159,000 based on a 95% confidence interval (Hampson *et al.*, 2015). According to WHO (2018), in over 99% of human fatalities from rabies, the virus is transmitted through bites from domestic dogs.

The disease is endemic and widespread among domestic dogs across Africa and most of Asia, and more than 99% of the global human deaths from rabies occur in these continents (Miranda and Miranda, 2020; WHO, 2018). The number of human deaths and the economic impact of rabies in Africa are directly linked to the increasing population of humans and dogs, and these will continue until there are coordinated control efforts and adequate funding (WHO, 2013). Humans have key roles to play in the dynamics of rabies by their personal decisions regarding their pets in terms of vaccinations, feeding, shelter, report of outbreaks and exposures (Das *et al*., 2025). These decisions are guided by accurate knowledge and clear understanding of the disease and the public health risks it poses (Ntampaka *et al*., 2018). Evidence from many countries shows that having a better understanding of rabies, proper first aid for dog bites, how dogs behave, and how to avoid being bitten is closely linked to safer behaviors and lower rabies risk in humans. (Ntampaka *et al*., 2018; Sambo *et al*., 2014).

Research from across Nigeria consistently show that rabies is still a serious and ongoing public health issue with domestic dogs acting as the primary reservoir and source of transmission to both humans and other animals (Abubakar *et al*., 2023; Mshelbwala *et al*., 2021; Ikye-Tor *et al*., 2020; Audu *et al*., 2019 and Otolorin *et al*., 2015) where about 10,000 people are reportedly bitten by dogs and exposed each year (Al-Mustapha *et al*., 2022; Edukugho *et al*., 2018 and Hampson *et al.*, 2015). However, documented reports seem to suggest that the report of dog bite injuries is on the decline in Makurdi despite the proliferation of dogs, veterinary outlets, and human hospitals (Ikye-Tor *et al*., 2020). The potential risk of exposure to the rabies virus from someone bitten by a dog must be addressed immediately (Henderson *et al*., 2018). Transmission of rabies to people can be significantly reduced when people have access to health information and actively seek medical care for the disease (Bonaparte *et al*., 2021). Therefore, information about knowledge gaps about rabies is a pivotal factor when planning for effective interventions and control strategies (Sambo *et al*., 2014). To address this, a Knowledge, Attitudes and Practices survey was conducted to gauge the awareness and perceptions of the residents of Makurdi towards rabies.

Methodology

Study area

Makurdi, the Benue State capital, is situated in North–Central Nigeria, lying between latitudes 7°40 N and 7°53 N, and longitudes 8°22 ′ E and 8°35 ′ E. The city covers a circular area with a 16km radius along the banks of the Benue River, spanning a total land area of 804km^2. According to the 2006 census, Makurdi had a population of 300,377 people (Nigeria, 2007) and is now projected to be 475, 412 (World Population Review, 2026). Makurdi has a high dog population. In the urban areas, dogs are primarily kept for security and companionship, while in the rural and peri-urban areas, they are sometimes also used for hunting.

Study design and Sampling

The sample size was determined using the Krejcie and Morgan (1970) formula, assuming a prevalence of 50%; a target of 383 was established. A multistage sampling technique was employed, beginning with the random selection of 5 wards from the 11 in Makurdi. In each selected ward, 80 questionnaires were distributed across households (n=35), offices (n=15), secondary schools (n=15), and business premises (n=15). Five major roads were randomly identified per ward. Along these roads, every 5th house on the first seven side streets was sampled, alongside three business premises. In each location, one adult respondent was interviewed. Furthermore, the largest secondary school and office facility within each ward were included.

A structured questionnaire was validated through a pre-test with 35 respondents in Modern Market Ward. Participation was voluntary; only those providing verbal consent were included. In instances where a site declined, the facilitator systematically moved to the next site to maintain the sampling frame. All data were maintained under strict confidentiality.

The questionnaire comprised 5 sections: (A) demographics; (B) dog ownership history; (C) rabies knowledge (transmission, symptoms, and prevention); (D) attitudes and practices; and (E) awareness of rabies legislation. The multiple-choice questions utilized a "Yes," "No," and "Don't know" format. Responses were scored using a binary marking guide: correct answers

earned one point, while No" or "Don't know" responses scored zero points. This scoring system ensured that uncertainty was treated as a lack of knowledge. In instances where a household declined participation, the facilitator systematically moved to the next available household to maintain the sampling frame.

Data analysis

Data management was performed using Microsoft Excel before being exported to IBM SPSS Statistics (version 23.0) for analysis. Descriptive statistics were utilized to summarize variables in tabular form. To evaluate knowledge and attitudes, respondents were categorized using a 70% threshold; scores ≥70% were classified as "adequate" knowledge or "positive" attitude, while scores below this mark were deemed "inadequate" or "negative". The relationship between sociodemographic factors, dog ownership and these outcomes was analyzed through a two-step logistic regression approach. Initially, univariate analysis identified variables associated with the outcomes at a relaxed p-value of ≤0.02. Following the methodology of Spargo *et al*. (2021), these candidate variables were entered into a forward stepwise multivariate logistic regression model. This process calculated adjusted odds ratios (aOR) and 95% confidence intervals (CI). Throughout the analysis, statistical significance was strictly defined by a p-value <0.05. This robust modeling allowed for the identification of independent predictors for rabies-related knowledge and attitudes within the study population.

Results

Out of the 400 questionnaires distributed targeting 383 respondents, 378 were completed and returned. Looking at the socio-demographic profile, most respondents (45.2%) were aged 21–30 years, with only a small proportion over 50. Males made up 63.2% of the sample population, 44.2% were married, and 65.5% had education beyond secondary school. Half (50.1%) worked in government jobs, 42.9% owned dogs, and nearly all (99.2%) identified as Christian.

The mean score for knowledge was 17 out of 30, which was rated as fair. However, according to our evaluation of getting a minimum score of 70% from the questions asked, only 32.01% (121) of all the respondents were classified as having adequate knowledge of rabies. The univariate analysis identified gender (p=0.052), age group (p=0.191), dog ownership (p=0.013), and having been a victim of a dog bite (p=0.101) as factors potentially associated with adequate rabies knowledge. Other variables did not meet the criteria for inclusion in the multivariable model (p>0.20). The multivariable regression analysis demonstrated that only the predictor variable "dog ownership" was statistically associated with having adequate knowledge about rabies. In the univariate analysis, dog owners were 1.73 times more likely to have adequate knowledge (95% CI: 1.12 – 2.68; p = 0.013). Compared to non-dog owners. Even after controlling for other factors in the multivariate model, dog ownership stayed significant as an independent predictor, with owners having 1.67 times higher odds of adequate knowledge (95% CI: 1.07–2.59; p < 0.05). Further details are shown in Table 1.

Univariate logistic regression identified 3 factors linked to awareness of legislation (p<0.02); employment status, dog ownership, and knowing a dog bite victim. After adjusting for confounding variables, only employment status and dog ownership remained statistically significant. Dog owners demonstrated significantly higher awareness in both the univariate (OR = 1.99, p = 0.002) and final multivariate (aOR = 1.88, p < 0.05) analyses. Unemployed respondents had about 55% lower odds of awareness than employed respondents before (OR = 0.45, p = 0.032) and after (aOR = 0.46, p < 0.05) adjustment (Table 2).

The mean score for attitude was 5.5 out of 8, with 60.4% of respondents having a satisfactory attitude towards rabies. In the logistic regression analysis, occupation and education of respondents independently predicted a positive attitude towards rabies. Respondents with tertiary education had 4 times higher odds of a positive attitude compared to those with only primary education (adjusted OR = 4.06; 95% CI: 1.33–12.79; p < 0.05). Conversely, unemployed respondents were less likely to hold a positive attitude than employed respondents (aOR = 0.27; 95% CI: 0.12–0.61; p < 0.05). See Table 3 for details.

As shown in Table 4, general awareness of rabies was high among respondents as 92.9% (351) of them had heard of "rabies". The source of information was mostly informal discussions with family, friends and colleagues (44.4%). Mass media accounted for 23.4% followed closely by advice from animal health workers/veterinarians. Formal education was a source for just 4.0% of respondents, while a smaller proportion

Table 1: **Univariate and multivariate logistic regression analysis of factors associated with adequate rabies knowledge among respondents in Makurdi (n=378)**

Variable	Knowledge		Total	OR(95% CI)	P value	aOR(95% CI)
	Yes	No				
Gender						
Female	36	103	139	Ref		
Male	85	154	239	1.58 (0.99-2.51)	0.052	1.51 (0.95-2.42)
Age						
<21	10	31	41	Ref		
21 – 30	60	111	171	1.68 (0.77-3.65)	0.191	
31 – 40	33	61	94	1.68 (0.73-3.84)	0.219	
41 – 50	12	43	55	0.87 (0.33-2.25)	0.767	
>50	6	11	17	1.69 (0.50-5.75)	0.398	
Level of education						
Primary	5	10	15	Ref		
Secondary	33	83	116	0.80 (0.25-2.50)	0.695	
Tertiary	83	164	247	1.01 (0.34-3.06)	0.983	
Occupation						
Employed	62	131	193	Ref		
Student	47	104	151	0.95 (0.60-1.51)	0.843	
Unemployed	12	22	34	1.15 (0.54-2.48)	0.716	
Dog ownership						
No	58	158	216	Ref		
Yes	63	99	162	1.73 (1.12-2.68)	**0.0130**	**1.67 (1.07-2.59)**
Victim of dog bite						
No	96	221	317	Ref		
Yes	25	36	61	1.60 (0.91-2.81)	0.101	1.47 (0.82-2.60)
Aware of bite victim						
No	93	195	288	Ref		
Yes	28	62	90	0.95 (0.57-1.58)	0.834	

reported learning through personal experience (0.86%). A mix of other sources accounted for 4.27%. Although 73.22% (257) of the respondents knew that dogs could get infected and transmit the disease to humans, only 49% (172) correctly identified the cat as a possible host for transmission of the disease, while awareness of other high-risk animals like bats was extremely low at 0.6%.

Clear knowledge gaps were observed in understanding the transmission of the virus, as only 50.4% knew that humans can contract rabies, and 45.3% were uncertain whether dog bites are the sole mode of transmission. Many (59.3%) respondents, however, correctly identified that rabies can spread through the saliva of an infected animal. More than half (52.4%) were unaware of the main clinical signs of a rabid animal, such as foaming at the mouth and aggressive biting, and only 23.7% could correctly name these symptoms.

Information regarding knowledge of preventive practices is given in Table 5. From the survey, only 31.9% of respondents could correctly identify three months as the appropriate age for a dog's primary vaccination for rabies. Additionally, 16.0% believed that traditional medicine could prevent rabies in dogs, and another 45.0% were unsure whether it worked.

Responses to a dog bite reflected a mix of correct and incomplete understanding. While 93.9% (331) could list the correct course of action to take after being exposed to a suspected rabid animal (either wound washing or visiting the hospital/healthcare), only 33.9% (119) recognized that washing the wound with soap and water

Table 2: Logistic regression analysis of factors associated with "awareness of legislation" among respondents in Makurdi (n=378)

Variable	Awareness		Total	OR(95% CI)	P value	aOR(95% CI)
	Yes	No				
Gender						
Female	82	57	139	Ref		
Male	152	87	239	1.21 (0.79-1.86)	0.374	
Age						
<21	27	14	41	Ref		
21 – 30	95	76	171	0.65(0.32-1.32)	0.231	
31 – 40	60	34	94	0.92 (0.42-1.98)	0.821	
41 – 50	42	13	55	1.68 (0.68-4.11)	0.257	
>50	10	7	17	0.74 (0.23-2.37)	0.612	
Level of education						
Primary	10	5	15	Ref		
Secondary	70	46	116	0.76 (0.24-2.37)	0.637	
Tertiary	154	93	247	0.83 (0.27-2.50)	0.737	
Occupation						
Employed	128	65	193	Ref		
Student	90	61	151	0.75 (0.48-1.16)	0.199	0.79 (0.51-2.23)
Unemployed	16	18	34	0.45 (0.22-0.95)	**0.032**	**0.46 (0.22-0.98)**
Dog ownership						
No	119	97	216	Ref		
Yes	115	47	162	1.99 (1.29-3.07)	**0.002**	**1.88 (1.21-2.92)**
Victim of dog bite						
No	194	123	317	Ref		
Yes	40	21	61	1.21 (0.68-2.15)	0.519	
Know victim of bite						
No	172	116	288	Ref		
Yes	62	28	90	1.49 (0.90-2.47)	0.118	1.36 (0.81-2.29)

(the key first aid measure) should come first. In addition, 40.2% felt it was acceptable to delay seeking medical care for one to three days. Alarmingly, a great number of respondents (75.5%) had the misconception that people can still be cured of rabies after clinical signs develop, and only 4.8% knew that the disease is fatal at that point. When asked about how they would handle a suspected rabid dog, nearly half 49.3% said they would kill it right away. Fewer (13.7%) opted to report to authorities or take it to a veterinary hospital (31.1%). A few (1.42%) would even sell it off to unsuspecting individuals.

Discussion

Only 32% of the 378 participants in Makurdi had satisfactory knowledge of rabies, which is highly concerning. Most knowledge came from casual conversations with family, friends, and colleagues, which gave a basic awareness but lacked comprehensive details required for prevention or first aid. For instance, most people knew that dogs can transmit rabies, but very few knew about proper first aid for dog bites. This key information usually comes from professionals or media campaigns, which, in our study, did not have enough coverage. This level of acceptable knowledge (32%) aligns with results from Zimbabwe (36%) and Uganda (41%) (Omodo *et al*., 2020). It was, however, lower than findings reported elsewhere in Africa, including Nigeria (82%) (Edukugho *et al*., 2018), Ethiopia (56%) (Hagos *et al*., 2020), Rwanda (56%) (Ntampaka *et al*., 2018), and Tanzania (96%) (Kabeta *et al*., 2015).

Among respondents with some rabies knowledge, informal conversations were the main source of information at 54%. Media and veterinary/animal health professionals reached far fewer people (23.4% and 23.1%, respectively). This differs from other African studies where mass media is often cited as the primary source for rabies information (Omodo *et al*., 2020; Ntampaka *et al*., 2018). Animal health professionals should use media in the propagation of rabies information, particularly if the target of eliminating dog-mediated rabies by 2030 is to be achieved. Nevertheless,

Table 3: L**ogistic regression analysis of factors associated with positive attitude towards rabies control in Makurdi (n=378)**

Variable	Attitude		Total	OR(95% CI)	P value	aOR(95% CI)
	Good	Poor				
Gender						
Female	85	54	139	Ref		
Male	138	101	239	0.87 (0.57-1.33)	0.516	
Age						
<21	21	20	41	Ref		
21 – 30	88	83	171	1.01 (0.51-2.00)	0.978	0.73 (0.35-1.52)
31 – 40	62	32	94	1.84 (0.87-3.89)	0.106	1.04 (0.41-2.62)
41 – 50	37	18	55	1.96 (0.85-4.50)	0.112	0.97 (0.35-2.67)
>50	15	2	17	7.14 (1.45-35.29)	0.008	3.20 (0.56-18.21)
Level of education						
Primary	5	10	15	Ref		
Secondary	54	62	116	1.74 (0.56-5.41)	0.333	2.02 (0.61-6.65)
Tertiary	164	83	247	3.95 (1.31-11.94)	**0.009**	**4.06 (1.33-12.79)**
Occupation						
Employed	132	61	193	Ref		
Student	80	71	151	0.52 (0.34-0.81)	**0.004**	0.68 (0.37-1.24)
Unemployed	11	23	34	0.22 (0.10-0.48)	**0.001**	**0.27 (0.12-0.61)**
Dog ownership						
No	127	89	216	Ref		
Yes	96	66	162	1.02 (0.67-1.54)	0.928	
Victim of dog bite						
No	188	129	317	Ref		
Yes	35	26	61	0.92 (0.53-1.61)	0.779	
Know victim of bite						
No	171	117	288	Ref		
Yes	52	38	90	0.94 (0.58-1.51)	0.788	

Informal sources for dissemination of information should not be overlooked, as they are instrumental within local communities. The key is ensuring communities receive accurate, clear, and concise information.

Schools can reach large populations quickly within a given period, but in this study, only 4% of respondents who knew about rabies got that information from school, even though students made up 40% of the respondents. This mirrors an Ethiopian study where only 11% of participants identified educators as their primary source of rabies information (Hagos *et al*., 2020). This highlights the importance of teachers having proper knowledge so they can effectively educate children who are both at a critical developmental stage and among the most vulnerable to exposure.

Many respondents (66.4%) identified aggression as a key sign of rabies, matching the fact that the "furious" form is the most common type in animals (Digafe *et al*., 2015) and easier to recognize since affected animals often attack people and other animals (Fooks *et al*., 2017). In contrast, the paralytic form can go unrecognized because most people exclusively associate rabies with the "mad" presentation, and paralytic cases get misdiagnosed as other neurological diseases (WHO, 2018; Fooks *et al*., 2017). This misconception is dangerous, as individuals exposed to animals exhibiting paralytic symptoms may not seek post-exposure treatment, putting them at risk of a fatal outcome. Far fewer (23.35%) linked foamy salivation to the disease. It is important to note, however, that both forms of the disease are characterized by foamy salivation (Fooks *et al*., 2017).

"Dog ownership' was the only predictor variable significantly linked to adequate rabies knowledge. This may be because of owners' interactions with veterinarians/animal health workers who educate them on the wellbeing of their dogs. This matches findings from Ethiopia and Nigeria (Edukugho *et al*., 2018; Hagos *et al*., 2020), but contrasts with Rwanda, where neither pet ownership nor occupation showed a strong connection to rabies knowledge (Ntampaka *et al*., 2018).

Table 4: Knowledge and awareness of rabies transmission and symptoms among respondents in Makurdi

Specific characteristic	Frequency (n=351)	Percentage (%)
Ever heard of rabies? (n=378)		
No	27	7.1
Yes	351	92.9
Source of information		
Discussion (family/friends/colleagues)	156	44.4
Media (radio/TV/fliers)	82	23.4
Others	15	4.3
Personal experience	3	0.9
School	14	4.0
Animal health worker/Vet	81	23.1
Can all dogs transmit rabies?		
I don't know	78	22.22
No	16	4.56
Yes	257	73.22
Other animals likely to transmit rabies?		
Bats		
Cats	2	0.57
I don't know	172	49.00
None	51	14.53
Other listed species	95	27.06
	31	8.84
Can humans be infected with rabies?		
I don't know	85	24.22
No	89	25.36
Yes	177	50.43
Is transmission only through dog bites?		
I don't know	159	45.30
No	68	19.39
Yes	124	35.33
Can rabies spread through saliva?		
I don't know	118	33.62
No	25	7.12
Yes	208	59.26
Are foamy salivation and biting major signs?		
I don't know	184	52.42
No	84	23.93
Yes	83	23.65
Does rabies kill only animals?		
I don't know	95	27.07
No	196	55.84
Yes	60	17.09

After exposure to a suspected rabid dog, 60.4% of participants said they would go to the hospital, but only 49% said it should be immediate. Similar results have also been found by other authors (Abdela et al., 2017; Guadu et al., 2014). Only 33.9% mentioned wound washing with soap and water, which is lower than some other studies (Abdela et al., 2017; Yalemebrat et al., 2016), but similar to that of Singh and Choudhary (2005) and Digafe et al. (2015) in India and Ethiopia, respectively. This variation likely reflects differences in the level of awareness in different communities. Wound washing is cheap, widely accessible, and practical for all individuals, and according to WHO (2013), can raise survival chances by 50%. WHO recommends both

Table 5: Respondents' knowledge of rabies prevention, first aid and management

Specific characteristic	Frequency (n=351)	Percentage (%)
Correct age for primal dog vaccination?		
3 months		
6 months	112	31.9
I year	72	20.5
I don't know	4	1.1
	163	46.4
Can traditional medicine prevent rabies in dogs?		
I don't know		
No	158	45.0
Yes	137	39.0
	56	16.0
Immediate action after a dog bite		
Bandage to stop bleeding	8	2.3
Do nothing	5	1.4
Report to hospital	212	60.4
I don't know	7	2.0
Wash wound with soap and water	119	33.9
Waiting time before seeking medical attention?		
Act immediately	172	49.0
One day	31	9.1
Two days to three days	141	40.2
I don't know	6	1.7
Is rabies curable after onset of signs?		
I don't know	69	19.7
No	17	4.8
Yes	265	75.5
Action to take for a suspected rabid dog		
Do nothing	10	2.9
I don't know	6	1.7
Kill the dog	173	49.3
Report to an official	48	13.7
Sell the dog	5	1.4
Take the dog to a veterinary hospital	109	31.1
Can dog licensing help control rabies?		
I don't know		
No	69	19.7
Yes	29	8.2
	252	72.1

Washing the wound and starting vaccination immediately after contact with a suspected rabid animal, noting that this approach can prevent nearly all rabies deaths (WHO, 2013).

About half (49.29%) of respondents said they would kill a suspected rabid dog and 1.42% would sell it without considering other factors. The appropriate action to take is to quarantine and observe the dog for 10 days (OIE, 2016) by relevant authorities to exclude the possibility of rabies. Killing dogs is not only inhumane, but also greatly skews official rabies data, thereby propagating the cycle of neglect, as previously observed by Ntampaka *et al*. (2018) in Rwanda. On the positive side, respondents avoided unknown/sick dogs, kept strays off their property, and sought medical care after dog bites, thereby suggesting active involvement in rabies control. Older respondents had more positive attitudes, and both occupation and education level were significantly linked to attitude as well. This aligns with Ameh *et al*. (2014), who found that a positive attitude usually leads to better practices.

Conclusion

This study has shown that rabies knowledge and preventive awareness among Makurdi residents is inadequate. Critical deficiencies include a widespread

misconception that rabies can be treated after onset of symptoms, a lack of first aid knowledge for dog bites, and irresponsible dog ownership. While mass dog vaccination is vital, achieving the goal of zero human deaths from canine-mediated rabies by 2030 hinges on enhanced education and awareness. Consequently, strategic community sensitization campaigns are urgently recommended to bridge these gaps and align local efforts with global elimination targets.

Conflict of Interest

The authors declare no conflict of interest.

Financial Support

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

References

Abdela, N., Midekso, B., Jabir, J., & Abdela, W. (2017). Knowledge, attitudes and practices towards rabies in Dedo district of Jimma zone, southwestern Ethiopia: A community-based cross-sectional study. *International Journal of Medicine and Medical Sciences, 9*(5), 61–71. https://doi.org/10.5897/IJMMS2017.1293

Abubakar, A., Al-Mustapha, A., Oyewo, M., Ibrahim, A., Abdulrahim, I., Yakub, J., Elelu, N., Nguku, P., Balogun, M., Awosanya, E., Kia, G., Kwaga, J., Okoli, I., Bolajoko, M., Alimi, Y., Mbilo, C., & Dacheux, L. (2023). Prospects for dog rabies elimination in Nigeria by 2030. *Zoonoses and Public Health, 71*, 1–17. https://doi.org/10.1111/zph.13084

Al-Mustapha, A., Bamidele, F., Abubakar, A., Ibrahim, A., Oyewo, M., Abdulrahim, I., Yakub, J., Olanrewaju, I., Elelu, N., Gibson, A., Mazeri, S., & Bolajoko, M. (2022). Perception of canine rabies among pupils under 15 years in Kwara State, North Central Nigeria. *PLOS Neglected Tropical Diseases, 16*, e0010614. https://doi.org/10.1371/journal.pntd.0010614

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, 6*(5), 226–240. https://doi.org/10.5539/gjhs.v6n5p226

Audu, S. W., Mshelbwala, P. P., Jahun, B. M., Bouaddi, K., & Weese, J. S. (2019). Two fatal cases of rabies in humans who did not receive rabies post-exposure prophylaxis in Nigeria. *Clinical Case Reports, 7*(4), 749–752. https://doi.org/10.1002/ccr3.2057

Bonaparte, S., Adams, L., Bakamutumaho, B., Costa, G., Cleaton, J., Gilbert, A., Osinubi, M., Pieracci, E., Recuenco, S., Tugumizemu, V., Wamala, J., & Wallace, R. (2021). Rabies post-exposure healthcare-seeking behaviors and perceptions: Results from a knowledge, attitudes, and practices survey, Uganda, 2013. *PLOS ONE, 16*, e0251702. https://doi.org/10.1371/journal.pone.0251702

Das, M., Yustyniuk, V., Perez, A., & Aguirreburualde, M. (2025). Global perspectives on rabies control and elimination: A scoping review of dog owners' knowledge, attitudes, and practices. *Pathogens, 14*, 728. https://doi.org/10.3390/pathogens14080728

Digafe, R. T., Kifelew, L. G., & Mechesso, A. F. (2015). Knowledge, attitudes and practices towards rabies: Questionnaire survey in rural household heads of Gondar Zuria District, Ethiopia. *BMC Research Notes, 8*, 400. https://doi.org/10.1186/s13104-015-1357-8

Edukugho, A., Umoh, J., Diem, M., Ajani, O., Uba, B., Okeke, L., Adedire, E., Adefisoye, A., Edukugho, C., & Nguku, P. (2018). Knowledge, attitudes and practices towards rabies prevention among residents of Abuja Municipal Area Council, Nigeria. *Pan African Medical Journal, 31*, 21. https://doi.org/10.11604/pamj.2018.31.21.15120

Fooks, A. R., Cliquet, F., Finke, S., Freuling, C., Lumlertdacha, B., Mettenleiter, T. C., Rupprecht, C. E., Tordo, N., Wong, S., & Müller, T. (2017). Rabies. *Nature Reviews Disease Primers, 3*(1), 1–20. https://doi.org/10.1038/nrdp.2017.91

Guadu, T., Shite, A., Chanie, M., Bogale, B., & Fentahum, T. (2014). Assessment of knowledge, attitude and practices about rabies and associated factors in Bahir Dar town. *Global Veterinaria, 13*(3), 348–354.

Hagos, W. G., Muchie, K. F., Gebru, G. G., Mezgebe, G. G., Reda, K. A., & Dachew, B. A. (2020). Assessment of knowledge, attitude and practice towards rabies and associated factors among household heads in Mekelle city, Ethiopia. *BMC Public Health, 20*, 1225. https://doi.org/10.1186/s12889-020-09378-x

Hampson, K., Coudeville, L., Lembo, T., Sambo, M., Kieffer, A., Attlan, M., Barrat, J., Blanton, J. D., Briggs, D. J., Cleaveland, S., Costa, P., Freuling, C. M., Hiby, E., Knopf, L., Leanes, F., Meslin, F. X., Metlin, A., Miranda, M. E., Müller, T., Nel, L. H., … Global Alliance for Rabies Control Partners for Rabies Prevention. (2015). Estimating the global burden of endemic canine rabies. *PLOS Neglected Tropical Diseases, 9*(4), e0003709. https://doi.org/10.1371/journal.pntd.0003709

Henderson, H., Carpenter, L., & Dunn, J. (2018). Rabies risk and use of post-exposure prophylaxis associated with dog bites in Tennessee. *Zoonoses and Public Health, 65*(4), 425–430. https://doi.org/10.1111/zph.12451

Ikye-Tor, P. M., Kwaga, J. K. P., Kia, G. S. N., Umoh, J. U., & Ikye-Tor, T. J. (2020). Retrospective study of dog bites and cases of rabies virus infected dogs in

slaughterhouses in Makurdi, Nigeria. *Sokoto Journal of Veterinary Sciences*, *18*(1), 18–26. https://doi.org/10.4314/sokjvs.v18i1.3

Kabeta, T., Deresa, B., Tigre, W., Ward, M. P., & Mor, S. M. (2015). Knowledge, attitudes and practices of animal bite victims attending an anti-rabies health center in Jimma Town, Ethiopia. *PLOS Neglected Tropical Diseases*, *9*(6), e0003867. https://doi.org/10.1371/journal.pntd.0003867

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, *30*(3), 607–610. https://doi.org/10.1177/001316447003000308

Miranda, M. E. G., & Miranda, N. L. J. (2020). Rabies prevention in Asia: Institutionalizing implementation capacities. In *Rabies and rabies vaccines* (pp. 103–116). Springer. https://doi.org/10.1007/978-3-030-21084-7_6

Mshelbwala, P., Weese, J., Sanni-Adeniyi, O., Chakma, S., Okeme, S., Mamun, A., Rupprecht, C., & Magalhães, R. (2021). Rabies epidemiology, prevention and control in Nigeria. *PLOS Neglected Tropical Diseases*, *15*, e0009617. https://doi.org/10.1371/journal.pntd.0009617

Nigeria. (2007). *Federal Republic of Nigeria official gazette: Legal notice on 2006 census results* (Vol. 94, No. 24). Government Printer.

Ntampaka, P., Nyaga, P., Gathumbi, J., Tukei, M., & Niragire, F. (2018). Knowledge, attitudes and practices regarding rabies among dog owners in Kigali, Rwanda. *PLOS ONE*, *13*(6), e0197474. https://doi.org/10.1371/journal.pone.0197474

Omodo, M., Ar Gouilh, M., Mwiine, F. N., Okurut, A., Nantima, N., Namatovu, A., Nakanjako, M. F., Isingoma, E., Arinaitwe, E., Esau, M., Kyazze, S., Bahati, M., Mayanja, F., Bagonza, P., Urri, R. A., Lovincer, M. N., Nabatta, E., Kidega, E., Ayebazibwe, C., Nakanjako, G., Sserugga, J., Ndumu, D. B., Mwebe, R., Mugabi, K., Gonzales, J. P., & Sekamatte, M. (2020). Rabies in Uganda: Knowledge, attitudes, practices and molecular characterization. *BMC Infectious Diseases*, *20*, 200. https://doi.org/10.1186/s12879-020-4917-y

Otolorin, G. R., Aiyedun, J. O., Mshelbwala, P. P., Ameh, V. O., Dzikwi, A. A., Dipeolu, M. A., & Danjuma, F. A. (2015b). A review on human deaths associated with rabies in Nigeria. *Journal of Vaccines & Vaccination*, *6*(1), 262. https://doi.org/10.4172/2157-7560.1000262

Sambo, M., Lembo, T., Cleaveland, S., Ferguson, H., Sikana, L., Simon, C., Urassa, H., & Hampson, K. (2014). Knowledge, attitudes and practices about rabies prevention and control in Tanzania. *PLOS Neglected Tropical Diseases*, *8*, e3310. https://doi.org/10.1371/journal.pntd.0003310

Singh, S. U., & Choudhary, S. K. (2005). Knowledge, attitude, behavior and practice study on dog bites. *Indian Journal of Community Medicine*, *30*, 3–12.

Spargo, R. M., Coetzer, A., Makuvadze, F. T., Chikerema, S. M., Chiwerere, V., Bhara, E., & Nel, L. H. (2021). Knowledge, attitudes and practices towards rabies: A survey of the general population residing in the Harare Metropolitan Province of Zimbabwe. *PloS one*, *16*(1), e0246103. https://doi.org/10.1371/journal.pone.0246103

World Health Organization. (2013). *WHO expert consultation on rabies (WHO Technical Report Series No. 982)*. https://www.who.int

World Health Organization. (2018). *WHO expert consultation on rabies: Third report (WHO Technical Report Series No. 1012)*. https://www.who.int

World Organisation for Animal Health (OIE) (2016). OIE *Terrestrial animal health code*. https://www.oie.int

World Population Review (2026). https://worldpopulationreview.com/cities/nigeria/makurdi

Yalemebrat, N., Bekele, T., & Melaku, M. (2016). Assessment of public knowledge, attitudes and practices towards rabies in Ethiopia. *Journal of Veterinary Medicine and Animal Health*, *8*, 183–192. https://doi.org/10.5897/JVMAH2016.0502