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Full Length Research

Risk perceptions regarding rabies among dog butchers and dog meat consumers, and the prevalence of rabies in slaughtered dogs in Southern Taraba State, Nigeria

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ABSTRACT: Rabies is a fatal zoonotic disease with significant public health implications, particularly in regions where the consumption and slaughter of dogs are culturally practised. Dog butchers and dog meat consumers in Southern Taraba State, Nigeria, are at high risk of exposure to rabies due to frequent contact with potentially infected animals. This study assessed the prevalence of rabies in apparently healthy dogs slaughtered for meat and examined the risk perceptions of rabies among dog butchers and consumers in Southern Taraba State, Nigeria. A cross-sectional study was conducted across five Local Government Areas using a combination of direct fluorescent antibody tests (DFAT) on dog brain tissue samples and a structured questionnaire survey. Sixty-two brain tissue samples were analysed for rabies antigen, while 110 individuals (55 dog butchers and 55 dog meat consumers) were surveyed to evaluate their risk perception of rabies. Data analysis included chi-square tests, logistic regression, and independent-samples t-tests. The prevalence of rabies among slaughtered dogs was 4.8% (3/62), with positive cases identified in Takum and Wukari LGAs. The questionnaire results indicated that while 68.1% of respondents recognised rabies as a serious disease, 63.6% believed that handling or consuming dog meat posed little risk. The Rabies Perception Index (RPI) revealed that dog meat consumers exhibited significantly higher risk perception than butchers ($p < 0.001$). Despite the low prevalence of rabies in slaughtered dogs, the presence of the virus poses a public health concern. Additionally, misconceptions regarding rabies transmission persist among dog butchers, potentially increasing their vulnerability. Targeted educational campaigns and rabies control measures, including vaccination and public awareness programs, are crucial for mitigating the risk of rabies transmission in this high-risk population.

Keywords: Dog butchers, dog meat consumers, Nigeria, rabies, risk perception, Taraba State.

INTRODUCTION

The rabies virus causes rabies, a fatal zoonotic disease that primarily affects mammals, including humans, when they come into contact with the saliva of infected animals (World Health Organisation, 2024). Every year, rabies claims the lives of tens of thousands of people worldwide, with Africa and Asia accounting for over 95% of these fatalities due to the disease's widespread prevalence and limited access to treatment and preventative measures (World Health Organisation, 2017). Given the great number of household and stray dogs, which are the main viral reservoirs, rabies still poses serious public health issues in Nigeria (Mshelbwala *et al*., 2021). The cultural

customs surrounding the killing and consumption of dogs in certain areas in Nigeria greatly increase the risk of transmission among the local population, especially for those who directly handle and consume dog meat (Ekanem *et al*., 2013; Okeme *et al*., 2020).

Dog butchers and consumers regularly expose themselves to dog saliva, tissue, and blood, which are the known vectors for rabies transmission (Konzing *et al*., 2015), as they consume dog meat as a delicacy in Southern Taraba State, Nigeria. Despite the inherent risks associated with these practices, there remains a scarcity of data on the local population's perceptions of rabies risk, particularly among individuals engaged in the handling, slaughter, and consumption of dogs. Understanding risk perceptions in this population is important, as they influence behaviours that can either mitigate or exacerbate the risk of exposure to rabies (Rana *et al*., 2021). High-risk perception may encourage preventive practices, such as the use of protective equipment and prompt post-exposure prophylaxis (Yamabhai *et al*., 2025), whereas low-risk perception can contribute to neglect of safety measures and increased vulnerability to infection (Mshelbwala *et al*., 2021; Yamabhai *et al*., 2025).

Assessing the actual prevalence of rabies in the region's dog slaughter population is essential, in addition to understanding community perceptions. The objective of this paper is to determine the prevalence of rabies among seemingly healthy dogs slaughtered in Southern Taraba State, as the study can reveal the level of risk faced by dog handlers and consumers. By integrating data on both risk perception and actual prevalence, this research seeks to inform local health authorities and policymakers on potential intervention strategies to reduce rabies transmission among high-risk populations and ultimately contribute to broader rabies control efforts in Nigeria.

METHODOLOGY

Study area

This study was conducted in Southern Taraba State, Nigeria. The Southern Taraba includes Donga, Ibi, Takum, Ussa, and Wukari Local Government Areas out of the sixteen Local Government Areas that make up Taraba State. Taraba is a state located in northeastern Nigeria, bordered to the west by Nasarawa and Benue States, to the northwest by Plateau State, to the north by Bauchi and Gombe States, to the northeast by Adamawa State, and to the east and south by the Republic of Cameroon (Taraba State Government, 2022).

The Southern Taraba State is known for its cultural practice of dog slaughter and dog meat consumption. The area constitutes various communities known for their dog meat selling and slaughter points (Ameh *et al*., 2014). Data collection took place at several point of these locations, with a focus on areas with high levels of dog meat handling and consumption. The specific study locations were chosen to represent a broad cross-section of the communities where individuals are routinely exposed to dogs in the context of slaughter and meat consumption.

Study design

A cross-sectional study design was used to assess the risk perceptions regarding rabies among dog butchers and dog meat consumers and to determine the prevalence of rabies in slaughtered dogs in the region. The study was conducted in two phases: a questionnaire survey on risk perception and a diagnostic analysis of rabies prevalence among slaughtered dogs.

Sample size determination

For the prevalence of rabies, the sample for the dog brain tissue of apparently healthy dogs presented for slaughter at these sites was calculated using Thrusfield's (2007) formula:

$$n = \frac{\mathrm{Z}^2 \,\mathrm{x}\, \mathrm{p}(1-\mathrm{p})}{\mathrm{d}^2}$$

Where: n = required sample size, Z = Z-value (standard normal deviate) for a given confidence level (for 95% confidence, Z = 1.96), P = estimated prevalence (2% or 0.02 in this case, based on Tirmidhi *et al*. (2019)), d = desired precision (margin of error), often set at 5% (0.05).

Substituting the values:

$$n = \frac{1.96^2 \,\mathrm{x}\, 0.02(1-0.02)}{0.05^2} = 30.08 \text{ (as the minimum sample)}$$

Rounding up, the required sample size is 31 dog brain tissue samples.

For a prevalence study aiming to detect rabies among slaughtered dogs in Southern Taraba State with an expected prevalence of 2% and a 5% margin of error, a minimum sample of 31 dog brain tissues is needed. This sample size ensures sufficient statistical power for detecting rabies prevalence among slaughtered dogs at a 95% confidence level. However, 62 dog brain tissue samples were collected from the study areas in order to increase the chances of detecting the antigen in the dog brain tissues.

For the questionnaire, the formula provided by Arsham (2002) was used to calculate the minimal number of respondents required for the questionnaire survey. Arsham (2002) provides a formula for estimating the sample size in survey-based studies where the population is large or undefined. The sample size for the survey was calculated as follows:

$N = 0.25/SE^2$

Where: N = required sample size, E = desired margin of error (expressed as a decimal)

The study used a desired margin of error of 5% (0.05). Hence, the sample size was calculated as follows:

$N= 0.25/(0.05)^2 = 100$

Thus, a minimum sample size of 100 participants is recommended for the questionnaire on risk perception regarding rabies among dog butchers and dog meat consumers. However, the sample size was augmented by 10% of the sample size to address probable non-response or missing data, resulting in a final target sample of 110 respondents.

Sampling technique

The study used a simple random sampling technique across various slaughter locations in Donga, Ibi, Takum, Ussa, and Wukari Local Government Areas to sample the dog brain tissue over two consecutive months (November to December, 2023) in order to determine the prevalence of rabies among apparently healthy dogs presented for slaughter in Southern Taraba State. Key slaughter points in Southern Taraba State were identified as primary sampling sites. These sites were selected based on their high levels of dog meat trade activity and their accessibility for sample collection. Community leaders and local authorities were consulted to confirm the active slaughter locations and ensure cooperation during data collection. For each dog sampled, data on location, sex, age, and breed were recorded. The researchers, who are also trained veterinary personnel, extracted the brain tissue samples from the dog's head immediately post-slaughter as described by Barrat and Blancou (1988), adhering to ethical handling and biosafety protocols. The researchers preserved the samples in a transport medium and promptly sent them to the National Veterinary Research Institute, Rabies Reference Laboratory, Vom, Plateau State, Nigeria, for testing.

For the questionnaire, a stratified random sampling technique was applied to ensure that the sample adequately represented the two primary groups involved in this study: dog butchers and dog meat consumers in Southern Taraba State, Nigeria. Stratification allowed us to separately assess the perceptions and risks associated with each group, enhancing the generalisability of the findings within these populations. The researchers divided the population into two distinct strata, which are the dog butchers and the dog meat consumers. The dog butchers are individuals who are directly involved in the handling, slaughter, and processing of dogs for meat. While dog meat consumers were individuals who regularly purchased and consumed dog meat. Each stratum was treated as a separate subgroup to ensure balanced representation in the sample. Within each stratum, simple random sampling was conducted to select participants and snowball sampling where necessary, particularly in cases where individuals were reluctant to participate due to the sensitive nature of the study topic. This approach ensured that each member of the identified population had an equal probability of selection. The sample was divided evenly between the two groups, resulting in 55 dog butchers and 55 dog meat consumers.

Data collection

Questionnaire: The survey's data collection began in January to March 2024 and involved administering a structured questionnaire to dog butchers and dog meat consumers in Southern Taraba State, Nigeria. The questionnaire was designed to capture participants' demographic information, knowledge, attitudes, and risk perceptions related to rabies. To ensure high response rates and accurate data, a team of trained research assistants carried out face-to-face interviews with participants at various locations, including dog slaughter sites, local markets, and community centres where dog meat was sold.

The questionnaire consisted of two main sections, which included demographic information, collecting details such as age, gender, education level, and occupation, providing a basis for understanding variations in risk perception across demographic groups. The second section is the risk perception of rabies, which measured how participants perceived the risk associated with handling and consuming dog meat, using questions focused on perceived severity, susceptibility, and concerns about rabies in their community.

The questionnaire included both closed and Likert scale questions to facilitate quantitative analysis and enhance the reliability of responses. Before full deployment, a pilot study was carried out where the questionnaire was pretested on a small sample of respondents in Wukari LGA to ensure clarity and relevance, with modifications made based on feedback. The Cronbach's alpha coefficient for the reliability analysis was computed and deemed good, with an internal consistency of 0.822 (α) among the questionnaire items.

The questionnaire was administered as a hard copy to dog meat consumers in the study areas. Each participant was provided with a brief introduction to the study, and informed consent was obtained prior to the interview. The English language was used during the interview, but where necessary, the interviews were conducted in the respondents' local languages to enhance comprehension and accuracy.

The research was performed in conformity with the ethical standards stated in the Declaration of Helsinki

(World Medical Association Declaration of Helsinki, 2001). All participants were informed of their right to confidentiality and anonymity. The purpose of the study was explained, emphasising that participation was voluntary and that respondents could withdraw at any time without consequence. Data was collected anonymously, with responses recorded into a secure database accessible only to the research team.

Specimen collection: Sixty-two dog brain tissue samples were extracted as described by Barrat and Blancou (1988), from dog slaughter sites in the five local government areas of Taraba State, Nigeria. Immediately post-slaughter, the brain tissue from each dog, specifically from the hippocampus, brain stem, and cerebellum, which are regions where the rabies virus is typically concentrated, was extracted (Barrat and Blancou, 1988). The brain samples were placed in labelled vials containing transport media to ensure stability during transport. Each vial was labelled with a unique identification code corresponding to the dog's data (location, sex, age, and breed) for later analysis. All personnel involved in sample collection wore protective equipment, including gloves and face shields, to prevent exposure to potential rabies infection. Tools used in sample collection were sterilised and safely disposed of according to biosafety protocols. Samples were placed in coolers with ice packs to maintain optimal temperature during transport from the slaughter sites to the National Veterinary Research Institute, Rabies Reference Laboratory, Vom, Plateau State, Nigeria. Upon arrival at the laboratory, samples were stored at -20 °C until they were ready to be analysed using the Direct Fluorescent Antibody Test (DFAT).

Laboratory analysis

The direct fluorescent antibody test (DFAT), a gold-standard diagnostic method for rabies (World Health Organisation, 2020), was used to determine the presence of rabies virus antigens in the brain tissue. The direct fluorescent antibody test (DFAT) for RABV antigen detection was carried out in the laboratory as outlined by Dean *et al*. (1996). This was conducted with monoclonal fluorescein isothiocyanate-labelled anti-rabies virus antibodies (FITC) from Fujirebio Diagnostics Inc., Malvern, Pennsylvania, USA, and a polyclonal antibody conjugate from Bio-Rad, Australia. Subsequently, each sample was examined using a fluorescence microscope, with positive cases determined by the detection of bright apple green rabies antigens within the brain cells. The findings were documented to ascertain the prevalence of rabies based on the sample characteristics, including location, sex, age, and breed of each dog sampled.

Data analysis

Data collected were analysed using both descriptive and inferential statistics using Statistical Package for the Social Sciences (SPSS) Version 25 (IBM® Statistics). Rabies prevalence was estimated as the proportion of DFAT-positive cases among the sampled dogs. Prevalence rates were further stratified by sex, breed, age, and location to identify any patterns in rabies infection. Differences in rabies prevalence across these categories were analysed using chi-square tests. Logistic regression was employed to assess the influence of demographic factors (sex, breed, age, and location) on rabies positivity, providing odds ratios (OR) and 95% confidence intervals (CI) to indicate the strength of associations.

The Rabies Perception Index was determined to quantify and compare rabies risk perception. A Rabies Perception Index (RPI) was created by assigning numeric values to responses, where higher values corresponded to stronger perceptions of risk. For each of the ten perception questions, responses were scored from 1 (lowest risk perception) to 4 (highest risk perception). The Perception of Rabies Risk was graded into four categories as follows: Low Risk Perception – 1st Quartile (lowest 25% of scores), Moderate Risk Perception – 2nd Quartile (next 25% of scores), High Risk Perception – 3rd Quartile (next 25% of scores), and Very High Risk Perception – 4th Quartile (highest 25% of scores) groups based on quartile distribution. To analyse differences in rabies risk perceptions between dog butchers and dog meat consumers, an independent-samples t-test was conducted on the Rabies Perception Index (RPI), a composite score derived from responses to perception questions. Chi-square tests were also applied to evaluate associations between demographic variables (dog butchers and dog meat consumers) and individual perception questions. A p-value below 0.05 was deemed statistically significant for all analyses.

RESULTS

Rabies prevalence in slaughtered dogs

A total of 62 dogs were sampled from five abattoirs across Southern Taraba State, Nigeria, and tested for rabies using the Direct Fluorescent Antibody Test (DFAT). The direct fluorescent antibody test (DFAT) revealed an apple green fluorescence in the DFAT-positive brain samples that were collected and screened (Figure 1). Rabies positivity was observed only in two locations, with 1 positive case in Takum LGA and 2 in Wukari LGA (Table 1). The prevalence of rabies among these dogs was found to be 4.8% (3/62). Table 1 shows the distribution of rabies positivity across location, age, sex, and breed categories, revealing no significant associations with rabies positivity. Chi-square tests indicated that location ($\chi^2 = 3.315$, $p = 0.507$), age ($\chi^2 = 0.160$, $p = 0.689$), sex ($\chi^2 = 0.134$, $p = 0.715$), and breed ($\chi^2 = 0.052$, $p = 0.820$) were not significantly related to rabies status among the sampled dogs. These results suggest a low and evenly distributed

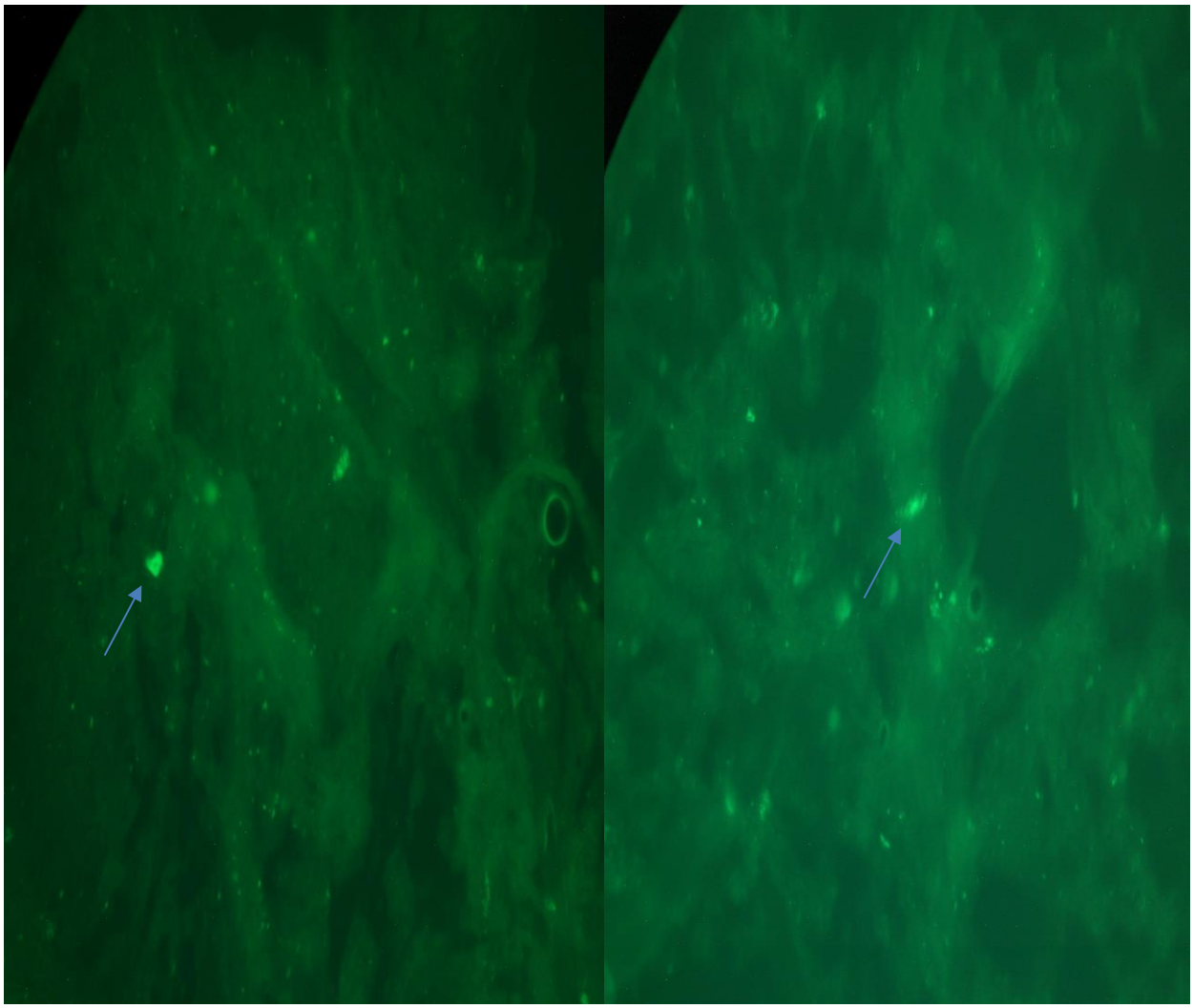

Figure 1. Microscopic view of two positive Direct Fluorescent Antibody (DFA) test on brain tissue sample showing characteristic bright apple green rabies antigens within the brain cells (arrows).

rabies prevalence among sampled dogs, without significant demographic influences (Table 1).

Predictors of rabies positivity

Logistic regression was conducted to assess the influence of demographic factors (location, age, sex, and breed) on the likelihood of rabies positivity. The results, presented in Table 2, show no significant predictors of rabies positivity, with all p-values exceeding 0.05. More so, the odds ratio (OR) for location indicated no substantial difference between Takum LGA (OR = 0.52, p = 0.62) and Wukari LGA (OR = 0.90, p = 0.89) in predicting rabies positivity; however, adult dogs had a 2.72 likelihood of rabies positivity than the puppies but were not statistically significant. Nevertheless, these findings show that none of the examined demographic factors had a significant impact on the likelihood of rabies positivity in this sample (Table 2).

Demographic characteristics and rabies risk perception among respondents

A total of 110 individuals participated in the study, consisting of an equal distribution of dog butchers (55) and dog meat consumers (55). The majority of respondents were male (80%), predominantly aged between 18–27 years (61.8%), and had secondary education as their highest level of education (52.7%). More than half of the respondents had experience in dog meat processing or consumption for 3–6 years (Table 3).

The respondents exhibited varied perceptions regarding rabies risk. Approximately 68.1% perceived rabies as either "very serious" or "serious," underscoring a substantial

Table 1. Rabies prevalence among sampled dogs and chi-square analysis.

Variables	Dog sampled N = 62 (%)	DFAT Positive (%)	DFAT Negative (%)	Chi-Square (χ^2)	p-value
Location of abattoir					
Donga LGA	10 (16.1)	0 (0)	10 (16.1)		
Ibi LGA.	8 (12.9)	0 (0)	8 (12.9)		
Takum LGA	16 (25.8)	1 (1.6)	15 (24.2)	3.315	0.507
Ussa LGA	11 (17.7)	0 (0)	11 (17.7)		
Wukari LGA	17 (27.4)	2 (3.2)	15 (24.2)		
Age					
Adult	59 (95.2)	3 (4.8)	56 (90.3)	0.160	0.689
Puppy	3 (4.8)	0 (0)	3 (4.8)		
Sex					
Male	35 (56.5)	2 (3.2)	33 (53.2)	0.134	0.715
Female	27 (43.5)	1 (1.6)	26 (41.9)		
Breed					
Local breed	61 (98.4)	3 (4.8)	58 (93.5)	0.052	0.820
Other breed	1 (1.6)	0 (0)	1 (1.6)		

The statistical test used is Chi-Square (χ^2) and $p<0.05$ is considered significant.

Table 2. Logistic regression results for predictors of rabies positivity.

Variables	B	S.E	p-value	OR (Exp(B))	95% CI for OR
Location of abattoir					
Takum L.G. A.	-0.65	1.33	0.62	0.52	0.04-7.00
Wukari L.G. A.	-0.10	1.45	0.89	0.90	0.06-13.86
Age					
Adult	1.00	1.10	0.36	2.72	0.35-21.18
Sex					
Male	0.45	1.33	0.73	1.57	0.12-21.18
Breed					
Local breed	-0.16	1.15	0.88	0.85	0.09-8.41
Constant	-1.20	1.55	0.44	0.31	-

B: Logistic regression coefficient; S.E.: Standard error of the coefficient; OR (Exp(B)): Odds ratio, indicating the effect size; and $p<0.05$ is considered significant.

awareness of its potential health impact. However, most respondents (63.6%) believed that contracting rabies from handling or consuming dog meat was "unlikely." The majority of respondents (52.7%) also reported that they were "not fearful" of contracting rabies from dog meat, suggesting a potential gap in perceived susceptibility to rabies despite recognition of its seriousness (Table 4).

When asked about the impact of contracting rabies, 34.5% considered it life-threatening, while 23.6% thought it would be serious but manageable. Concerns about rabies in the community were high, with 30.0% being "very concerned" and 28.2% "somewhat concerned." However, when questioned on whether consuming dog meat posed a rabies risk, 48.2% disagreed, and 37.3% strongly disagreed, indicating skepticism about the link between dog meat consumption and rabies transmission (Table 4).

Rabies Perception Index (RPI) and group comparisons

The Rabies Perception Index (RPI) was created to quantify respondents' risk perception of rabies, with scores categorised into quartiles: Low, Moderate, High, and Very High (Table 5). The Rabies Perception Index (RPI), which graded respondents' overall perception of rabies risk, revealed that 23.6% of respondents fell into the "Low Risk

Table 3. Demographic characteristics of respondents.

Variables	Category	Frequency	Percent (%)
Gender	Male	88	80.0
	Female	22	20.0
Age	18-27 Years	68	61.8
	28-37 Years	17	15.5
	38-47 Years	19	17.3
	48-57 years	6	5.5
Level of education	No formal education	21	19.1
	Primary education	15	13.6
	Secondary education	58	52.7
	Higher education	16	14.5
Occupation	Dog butcher	55	50.0
	Dog meat consumer	55	50.0
Years of experience	1-2 years	22	20.0
	3-4 years	34	30.9
	5-6 years	32	29.1
	7 years and above	22	20.0

Table 4a. Rabies risk perception among respondents.

Perception question	Response	Frequency	Percent (%)
How serious do you think rabies is as a health risk?	Very serious	27	24.5
	Serious	48	43.6
	Not serious	30	27.3
	Don't know	5	4.5
How likely do you think it is to contract rabies from handling or consuming dog meat?	Very likely	16	14.5
	Likely	19	17.3
	Unlikely	70	63.6
	Don't know	5	4.5
How fearful are you about contracting rabies from handling or consuming dog meat?	Very fearful	22	20.0
	Somewhat fearful	25	22.7
	Not fearful	58	52.7
	Don't know	5	4.5
In your opinion, what would be the impact of contracting rabies on health?	Life-threatening	38	34.5
	Serious but manageable	26	23.6
	Mild	35	31.8
	No impact	11	10.0
How concerned are you about the presence of rabies in your community?	Very concerned	33	30.0
	Somewhat concerned	31	28.2
	Not concerned	41	37.3
	Don't know	5	4.5

Table 4b. Rabies risk perception among respondents**.**

Perception question	Response	Frequency	Percent (%)
Do you believe that consuming dog meat poses a risk of rabies infection?	Strongly agree	5	4.5
	Agree	11	10.0
	Disagree	53	48.2
	Strongly disagree	41	37.3
How likely are you to seek immediate medical attention if bitten by a dog?	Very likely	26	23.6
	Likely	31	28.2
	Unlikely	48	43.6
	Not sure	5	4.5
Do you think rabies infection can be prevented?	Yes, through vaccination	41	37.3
	Yes, through avoiding dog meat	5	4.5
	No, it cannot be prevented	6	5.5
	Don't know	58	52.7
Do you believe the government should play a role in rabies prevention in your community?	Strongly agree	59	53.6
	Agree	41	37.3
	Disagree	10	9.1
	Strongly disagree	0	0
How likely are you to support community measures to vaccinate dogs against rabies?	Very likely	58	52.7
	Likely	21	19.1
	Unlikely	21	19.1
	Not sure	10	9.1

Table 5. Rabies perception index distribution among respondents.

Quartile Group	Frequency	Percent (%)
Low Risk Perception	26	23.6
Moderate Risk Perception	33	30.0
High Risk Perception	19	17.3
Very High Risk Perception	32	29.1

Table 6. Independent Samples T-test of rabies perception index by occupation (dog butchers and dog meat consumers).

Variables	N	Mean ± Std. Deviation	t	df	Sig. (2-tailed)	95% CI of the Difference
Dog meat consumer	55	27.56±4.475	9.692	108	0.000*	7.159 – 10.841
Dog butcher	55	18.56±5.234				

*p<0.05 is considered significant.

Perception" category, while 29.1% were in the "Very High Risk Perception" category (Table 5).

When comparing dog butchers and dog meat consumers, an independent samples t-test showed a statistically significant difference in RPI scores, with dog meat consumers having a higher perception of rabies risk (Mean = 27.56, SD = 4.475), $t(108) = 9.692$, $p < 0.001$ compared to dog butchers (Mean = 18.56, SD = 5.234) (Table 6). This finding suggests that dog meat consumers are more likely to perceive rabies as a significant health risk compared to butchers (Table 6).

Associations between occupation and rabies perception

Chi-square tests revealed significant associations between occupation (dog butcher vs. dog meat consumer) and

Table 7a. Chi-square test results for association between occupation (dog butchers and dog meat consumers) and rabies perception.

Perception Question	Occupation	Responses (%)				Chi-Square (χ^2)	p-value
How serious do you think rabies is as a health risk?		**Very Serious**	**Serious**	**Not Serious**	**Don't Know**	41.600	0.000*
	Dog butchers	6 (5.5)	16 (14.5)	29 (26.4)	4 (3.6)		
	Dog meat consumers	21 (19.1)	32 (29.1)	1 (0.9)	1 (0.9)		
How likely do you think it is to contract rabies from handling or consuming dog meat?		**Very Likely**	**Likely**	**Unlikely**	**Don't Know**	36.352	0.000*
	Dog butchers	0 (0)	3 (2.7)	48 (43.6)	4 (3.6)		
	Dog meat consumers	16 (14.5)	16 (14.5)	22 (20.0)	1 (0.9)		
How fearful are you about contracting rabies from handling or consuming dog meat?		**Very Fearful**	**Somewhat Fearful**	**Not Fearful**	**Don't Know**	49.001	0.000*
	Dog butchers	6 (5.5)	0 (0)	45 (40.9)	4 (3.6)		
	Dog meat consumers	16 (14.5)	25 (22.7)	13 (11.8)	1 (0.9)		
In your opinion, what would be the impact of contracting rabies on health?		**Life-threatening**	**Serious but manageable**	**Mild**	**No Impact**	60.897	0.000*
	Dog butchers	6 (5.5)	6 (5.5)	34 (30.9)	9 (8.2)		
	Dog meat consumers	32 (29.1)	20 (18.2)	1 (0.9)	2 (1.8)		
How concerned are you about the presence of rabies in your community?		**Very Concerned**	**Somewhat Concerned**	**Not Concerned**	**Don't Know**	66.487	0.000*
	Dog butchers	6 (5.5)	5 (4.5)	40 (36.4)	4 (3.6)		
	Dog meat consumers	27 (24.5)	26 (23.6)	1 (0.9)	1 (0.9)		

$p<0.05$ is considered significant.

Table 7b. Chi-Square test results for association between occupation (dog butchers and dog meat consumers) and rabies perception.

Perception question	Occupation	Responses (%)				Chi-Square (χ^2)	p-value
Do you believe that consuming dog meat poses a risk of rabies infection?		**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**	31.192	0.000*
	Dog butchers	0 (0)	5 (4.5)	16 (14.5)	34 (30.9)		
	Dog meat consumers	5 (4.5)	6 (5.5)	37 (33.6)	7 (6.4)		
How likely are you to seek immediate medical attention if bitten by a dog?		**Very Likely**	**Likely**	**Unlikely**	**Not Sure**	55.787	0.000*
	Dog butchers	0 (0)	10 (9.1)	41 (37.3)	4 (3.6)		
	Dog meat consumers	26 (23.6)	21 (19.1)	7 (6.4)	1 (0.9)		
Do you think rabies infection can be prevented?		**Yes, through vaccination**	**Yes, through avoiding dog meat**	**No, it cannot be prevented**	**Don't Know**	17.605	0.001*
	Dog butchers	14 (12.7)	0 (0)	6 (5.5)	35 (31.8)		
	Dog meat consumers	27 (24.5)	5 (4.5)	0 (0)	23 (20.9)		
Do you believe the government should play a role in rabies prevention in your community?		**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**	14.423	0.001*
	Dog butchers	22 (20.0)	23 (20.9)	10 (9.1)	0 (0)		
	Dog meat consumers	37 (33.6)	18 (16.4)	0 (0)	0 (0)		
How likely are you to support community measures to vaccinate dogs against rabies?		**Very Likely**	**Likely**	**Unlikely**	**Not Sure**	14.065	0.003*
	Dog butchers	22 (20.0)	9 (8.2)	15 (13.6)	9 (8.2)		
	Dog meat consumers	36 (32.7)	12 (10.9)	6 (5.5)	1 (0.9)		

*$p<0.05$ is considered significant.

various perception questions related to rabies (Table 7). The perceived seriousness of rabies ($\chi^2 = 41.600$, $p < 0.001$) varied significantly by occupation, with dog meat consumers more likely to consider rabies "very serious." The likelihood of contracting rabies ($\chi^2 = 36.352$, $p < 0.001$) showed that consumers were more likely to believe they could contract rabies from handling or consuming dog meat compared to butchers (Table 7).

The fear of contracting rabies ($\chi^2 = 49.001$, $p < 0.001$) and concern about rabies presence in the community ($\chi^2 = 66.487$, $p < 0.001$) were significantly higher among dog meat consumers. And regarding rabies prevention, consumers were more likely to agree that rabies infection could be prevented through vaccination ($\chi^2 = 17.605$, $p = 0.001$) and that the government should play a role in prevention efforts ($\chi^2 = 14.423$, $p = 0.001$), as seen in Table 7.

DISCUSSION

This study reported the prevalence of rabies in slaughtered dogs as well as the perception of dog butchers and dog meat customers in Southern Taraba State, Nigeria, on the risk of getting the disease. The prevalence of rabies shows that 4.8% of the dogs in the sample were positive for the disease. The 4.8% dog brain samples positive for rabies antigen by DFAT are higher than the 2.0% reported by Tirmidhi *et al*. (2019) in Taraba State; however, it is lower than the 7.98% by Ameh *et al*. (2014) reported in Wukari Metropolis, Taraba State; on its northwest border (Plateau State), a prevalence of 43% was reported by Sabo (2009); on the other hand, on its northeast border (Adamawa State), a 44% prevalence was reported by Aliyu *et al*. (2010) in Yola, Adamawa State. The smaller sample size of dogs in this study may be the cause of the decreased prevalence. These results show that rabies still raises public health issues.

The lack of strong association between rabies-positive and demographic characteristics suggests that rabies may be sporadic in this group rather than concentrated among certain demographics or geographic areas. More so, the lack of demographic indicators for rabies positivity fits the irregular transmission patterns seen in certain endemic areas, as rabies outbreaks may not always be related to particular risk factors in the canine population. Even isolated instances of rabies provide a significant risk to human handlers (World Health Organisation, 2024); hence, even if the low prevalence would indicate minimal risk, public health awareness is still very important. This emphasises the need to run ongoing public health campaigns focusing on rabies vaccination programs and public awareness campaigns to stop any potential outbreaks.

The results of the risk perception studies show how differently consumers of dog meat and dog butchers see rabies awareness and concern. Although the majority (68.1%) agreed that rabies adversely affects one's health, 63.6% of respondents stated the risk of getting the disease by handling or eating dog meat is "unlikely." More so, dog butchers Rabies Perception Index (RPI) values' were much lower than those of dog meat consumers, suggesting a less elevated sense of rabies risk, and they are particularly inclined to share this viewpoint, and this finding is consistent with the report of Tekki *et al*. (2023) in Plateau State, Nigeria. These results are also consistent with research demonstrating that people who interact with animals might find themselves less likely to see themselves as susceptible to zoonotic infections (Overgaauw *et al*., 2020). This may be the outcome of habit and familiarity, which unintentionally reduce perceived personal risk. The questions about the spread of rabies from dog meat draw attention to a significant ignorance in public understanding. Misperceptions about transmission channels might compromise preventive initiatives, as persons who do not identify a direct risk could be less inclined to participate in protective behaviours, such as helping dog vaccination programs or seeking prompt medical attention after a potential exposure. Even in dogs that seem healthy, training dog butchers in particular about the possibility of rabies transmission can help to dispel certain misunderstandings and encourage preventative measures.

Dog meat customers and dog butchers had somewhat different opinions on rabies, as consumers typically showed a more perceived risk. A strong association between dog butchers and consumers and the numerous variables of rabies perception, including perceived severity, chance of transmission, and fear of rabies infection, were found using chi-square testing. While consumers, as end users, may be more likely to regard eating dog meat as a health risk owing to cultural beliefs or secondary information, this knowledge gap may emerge from exposure and knowledge disparities; butchers may normalise their risk through regular exposure and handling of dog meat. Those who consumed dog meat also backed government involvement and preventative initiatives such as campaigns for community-wide canine rabies vaccination for dogs. Health professionals may increase community-level support for rabies control activities by stressing consumer knowledge and exploiting their desire to participate in preventative actions, therefore stressing a potentially important area for public health campaigns. Making sure butchers understand the need for these behaviours might lead to a community-wide strategy meant to prevent rabies.

The results of this research underline the necessity of focused educational programs to eliminate certain misunderstandings and information gaps concerning the spread of the rabies. Preventive actions might be strengthened, especially by initiatives to raise dog butchers' knowledge of the risks of handling possibly infected animals and the advantages of vaccinations. Particularly considering the support dog meat consumers

have shown for government-led rabies prevention, policy decisions meant to raise dog vaccination rates and assist community-level rabies education should be greatly valued. Furthermore, the considerable variations in rabies attitudes based on employment emphasise the need for customised intervention considering the various risk profiles and concepts of different groups engaged in the dog meat business. Public health professionals, veterinarians, community health workers, and each other may create culturally appropriate teaching materials and awareness campaigns covering occupational risks and general community safety. By closing the gap between knowledge of the disease and behaviour, such focused initiatives might help lower the risks of rabies spreading in the population.

This research has several limitations, even if it presents important data. Given the somewhat small sample size for rabies frequency, the results may not be as pertinent to Nigeria's greater dog numbers. Furthermore, as the cross-sectional technique only collects perceptions at one particular moment, it would not properly show how beliefs have changed over time or in reaction to health programs related to rabies. Future studies might increase the sample size and add longitudinal studies to evaluate the effect of educational interventions on the opinions of rabies risk and preventative actions on high-risk groups.

Conclusion

The 4.8% prevalence of rabies in the sampled slaughtered dogs as well as the clear differences in how dog butchers and dog meat consumers in Southern Taraba State, Nigeria, see the risk of rabies serve to sum up this research. The results imply that while there is information regarding rabies, false beliefs about the mode of transmission may hamper the control of the disease. Targeted educational and preventative efforts tailored to specific occupational roles may serve to improve rabies prevention programs and support more general public health objectives in areas where rabies is very common. Future research can advance on investigating the role of socioeconomic factors such as income and sociocultural factors, in shaping preventive behaviour could further refine public health strategies.

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CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

REFERENCES

Aliyu, T. B., De, N., Yenda, E. N., & Lynn, M. (2010). Prevalence of rabies virus antigens in apparently healthy dogs in Yola, Nigeria. *Researcher, 2*(2), 1-14.

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.

Arsham, H. (2002). *Questionnaire design and surveys sampling, survey: The online survey tool* (provide a website link for this reference).

Barrat, J., & Blancou, J. (1988). *Simplified technique for the collection, storage and shipment of brain specimens for rabies diagnosis* (WHO/Rabies Research/88.27). World Health Organization.

Dean, D. J., Abelseth, M. K., & Atanasiu, P. (1996). The fluorescent antibody test. In: Meslin F‐X, Kaplan M. M., Koprowski, H. (ed.). *Laboratory techniques in rabies*, fourth edition Geneva: World Health Organization. Pp. 88-95.

Ekanem, E. E., Eyong, K. I., Philip-Ephraim, E. E., Eyong, M. E., Adams, E. B., & Asindi, A. A. (2013). Stray dog trade fuelled by dog meat consumption as a risk factor for rabies infection in Calabar, southern Nigeria. *African Health Sciences, 13*(4), 1170-1173.

Konzing, L., Umoh, J. U., & Dzikwi, A. A. (2015). Trade dog-dog meat processors interface in rabies transmission. *International Journal of Applied Research, 1*(11), 83-91.

Mshelbwala, P. P., Weese, J. S., Sanni-Adeniyi, O. A., Chakma, S., Okeme, S. S., Mamun, A. A., Rupprecht, C. E., & Magalhaes, R. S. (2021). Rabies epidemiology, prevention and control in Nigeria: Scoping progress towards elimination. *PLoS Neglected Tropical Diseases, 15*(8), e0009617.

Okeme, S. S., Kia, G. S., Mshelbwala, P. P., Umoh, J. U., & Magalhães, R. S. (2020). Profiling the public health risk of canine rabies transmission in Kogi State, Nigeria. *One Health, 10*, 100154.

Overgaauw, P. A., Vinke, C. M., van Hagen, M. A., & Lipman, L. J. (2020). A one health perspective on the human–companion animal relationship with emphasis on zoonotic aspects. *International Journal of Environmental Research and Public Health, 17*(11), 3789.

Rana, M. S., Jahan, A. A., Kaisar, S. G., Siddiqi, U. R., Sarker, S., Begum, M. I. A., Ghosh, S., Sarker, S., Ahmed, B. N., & Shamsuzzaman, A. K. M. (2021). Knowledge, attitudes and perceptions about rabies among the people in the community, healthcare professionals and veterinary practitioners in Bangladesh. *One Health, 13,* 100308.

Sabo, G. K. (2009). *The role of dog trade in the epidemiology of rabies in Plateau State of Nigeria* (Master's thesis). Department of Veterinary Public Health and Preventive Medicine, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria.

Taraba State Government (2022). *Taraba State Government at a Glance (TSG), 2022*. Retrieved from https://tarabastate.gov.ng/.

Tekki, I. S., Odita, C. I., Ifende, V. I., Meseko, C. I., Bala, A., Konzing, I., Aneke, E. T., Ezekiel, P., & Muhammad, M. (2023). Assessment of perception of rabies infection risk among dog

handlers and dog meat consumers in Plateau State, Nigeria. *Sahel Journal of Veterinary Sciences, 20*(2), 22-28.

Thrusfield, M. (2007). *Veterinary epidemiology* (3rd edition). Oxford, UK: Blackwell Science Ltd.

Tirmidhi, A. B., Kazeem, H. M., Jibril, A., Jahun, B. M., & Orakpoghenor, O. (2019). Detection of rabies virus antigen in brain tissue of dogs slaughtered for human consumption in Taraba State, Nigeria. *Sokoto Journal of Veterinary Sciences, 17*(4), 9-13.

World Health Organisation (2017). *Control of Neglected Tropical Diseases*. Retrieved from https://www.who.int/teams/control-of-neglected-tropical-diseases/interventions/strategies.

World Health Organisation (2020). *Control of neglected tropical diseases: Diagnosis: Rabies*. Retrieved from https://www.who.int/teams/control-of-neglected-tropical-diseases/rabies/diagnosis.

World Health Organisation (2024, June 5). *Rabies*. Retrieved from https://www.who.int/news-room/fact-sheets/detail/rabies#:~:text=Dog-mediated%20rabies.

World Medical Association (2001). World Medical Association Declaration of Helsinki. Ethical principles for medical research involving human subjects. *Bulletin of the World Health Organization, 79*(4), 373-374.

Yamabhai, J., Cusripituck, P., Mingbualuang, T., Sangkachai, N., Sakchainanon, W., Tungwongjulaniam, C., Yurachai, O., Theerawat, R., & Wiratsudakul, A. (2025). A persona-based exploration of rabies post-exposure prophylaxis seeking behavior and its implication for communication strategic planning: Evidence from Thailand. *One Health*, 100980.