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Research Article

Assessment of Knowledge, Attitude and Practice Regarding Rabies and Associated Risk Factors among Kondala District, Oromia Regional State, Western Ethiopia

Hissa Dingeta Taressa[1]*, Tuge Temesgen[1]

[1]*Department of Veterinary Science, College of Agriculture and Natural Resources, Assosa University, Assosa, Ethiopia*

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ABSTRACT

Background: Rabies is a neglected, almost invariably fatal zoonotic disease that causes an estimated 59,000 human deaths annually worldwide. Ethiopia bears the second-highest burden of rabies in Africa, with approximately 2,700 human deaths per year, yet community knowledge, attitudes, and practices (KAP) in many rural districts remain unexplored. This study aimed to assess KAP towards rabies and identify associated risk factors among households in Kondala District, Western Ethiopia.

Methods: A community-based cross-sectional study was conducted from October 2024 to October 2025 in Kondala District, Oromia Region. A multistage sampling technique was used to select 200 household heads. Data were collected using a pre-tested structured questionnaire covering socio-demographics, knowledge (10 items), attitudes (4 items), and practices (5 items). KAP scores were categorised as "good" (≥60% correct/positive) or "poor". Multivariable logistic regression was performed using STATA version 17 to identify factors associated with good KAP scores; statistical significance was set at $p<0.05$.

Results: Only 52.0% of respondents were aware of rabies. Overall, 68.5% had good knowledge, 65.5% good attitude, and 68.0% good practice scores. Major misconceptions included: 70.0% believed that eating infected meat transmits rabies, and only 20.0% correctly identified animal bites as the primary transmission route. Although all respondents knew that post-exposure prophylaxis (PEP) can prevent rabies after a bite, only 56.0% were aware of dog vaccination. Dog vaccination coverage was 0%, and 60.0% preferred herbal remedies over PEP after a bite. Younger age (18–30 years: adjusted OR=13.08, p=0.001), higher education (adjusted OR=24.50, p=0.004), and male sex (adjusted OR=2.51, p=0.003) were significantly associated with better KAP scores. Occupation, household size, religion, and dog ownership were not significant.

Conclusions: Critical gaps in rabies KAP exist in Kondala District, characterised by widespread misconceptions, zero dog vaccination, and reliance on traditional remedies. Immediate, sustained public health interventions – including community education, free dog vaccination campaigns, and improved PEP accessibility – are urgently needed to prevent human rabies deaths.

1. Introduction

1.1 Background

Rabies is a neurotropic viral disease caused by *Lyssavirus rabies* (family Rhabdoviridae, order Mononegavirales) and is transmissible to all mammals. It is one of the 20 neglected tropical diseases identified by the World Health Organization (WHO), with a case fatality rate approaching 100% once clinical symptoms appear (WHO et al., 2018). Globally, rabies kills an estimated 59,000 people annually, with 99% of human cases resulting from bites by infected dogs (WHO, 2023). The disease also imposes a severe economic burden: the global cost of post-exposure prophylaxis (PEP), livestock losses, and other rabies-related expenses is estimated at US$ 8.6 billion per year (WHO, 2023).

In Africa, rabies is endemic, and dogs are responsible for more than 99% of human cases (WOAH, 2022). Ethiopia is one of the most heavily affected countries on the continent, with an estimated 2,700 human deaths each year (CDC, 2017). According to a five-year retrospective study by the Ethiopian Public Health Institute, 87 human rabies cases were clinically identified between 2015 and 2019, all of which were fatal; dogs were responsible for 95.4% of those deaths (Aklilu et al., 2021). The high incidence of canine rabies in Ethiopia is attributed to a large dog population (estimated dog-to-human ratios of 1:6 in urban and 1:8 in rural areas) combined with poor dog management and extremely low vaccination coverage – for example, only 3.9% of dogs in Addis Ababa were vaccinated (Kidane et al., 2016; Wario et al., 2018).

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Despite the availability of effective human and animal vaccines, rabies prevention and control in Ethiopia face multiple challenges. These include limited public awareness, reliance on traditional and religious treatments for animal bites, inadequate surveillance, and poor access to PEP, especially in rural areas (Deressa et al., 2010). In many rural communities, victims first consult traditional healers or use herbal remedies, and only seek medical care after neurological symptoms appear – at which point survival is impossible. Understanding the knowledge, attitudes, and practices (KAP) of communities regarding rabies is therefore a critical first step in designing targeted interventions.

1.2 Statement of the problem

Rabies remains a significant public health threat in Ethiopia, particularly in rural districts where access to health information, dog vaccination services, and PEP is limited. Kondala District, located in the West Wollega Zone of the Oromia Region, is a largely agricultural and pastoral area with a high dog population and frequent human- animal interactions. However, to the best of our knowledge, no previous study has assessed community KAP towards rabies in this district. The absence of baseline data hinders the design and implementation of effective rabies control programmes. Furthermore, anecdotal reports from local health workers suggest that traditional remedies are commonly used after dog bites, and dog vaccination is virtually non- existent. Therefore, this study was designed to fill this gap by systematically assessing the level of knowledge, attitudes, and practices regarding rabies among households in Kondala District and identifying the socio- demographic factors associated with these outcomes.

1.3 Objectives

1.3.1 General objective

To assess the knowledge, attitudes, and practices of the community regarding rabies and associated risk factors in Kondala District, Oromia Regional State, Western Ethiopia.

1.3.2 Specific objectives

1. To determine the level of knowledge about rabies transmission, clinical signs, prevention, and treatment among community members in Kondala District.
2. To assess the attitudes of the community towards rabies prevention, control measures, and treatment- seeking behaviours.
3. To evaluate the common practices related to rabies prevention, dog management, and response to animal bites.
4. To identify socio- demographic and other risk factors associated with good knowledge, attitude, and practice scores.

2. Materials and Methods

2.1 Description of the study area

The study was conducted in Kondala District, one of the districts of the West Wollega Zone, Oromia Regional State, Western Ethiopia. The administrative centre of the district is Gaba Dafino town, which was established in December 2005 after being separated from the Begi district. Kondala District is bounded by the Benishangul- Gumuz Region and Mana Sibu district in the north, Kelem Welega Zone in the south and southeast, Begi district in the west, and Babo Gambel district in the northeast. According to the 2007 national census, the district had a total population of 96,253 (48,612 men and 47,641 women), with 18,286 households; 3,117 people (3.24%) lived in urban areas. The majority of the inhabitants are Muslim (85.39%), followed by Ethiopian Orthodox Christians (7.92%) and Protestants (6.61%).

Agriculturally, the district is mixed farming, with livestock playing a vital role in the local economy. According to the Kondala District Agriculture Office's 2024 animal population data, the livestock population comprised approximately 289,675 cattle, 128,210 sheep, 190,789 goats, 6,028 equines, and 243,701 poultry. Dogs are numerous, though exact counts are not available; local estimates indicate that almost every household owns at least one dog for guarding purposes. The district has one health centre (in Gaba Dafino town) and several health posts, but veterinary services are limited, and dog vaccination campaigns have never been conducted systematically.

2.2 Study population

The study population consisted of all household heads or their representatives (aged ≥18 years) who had been living in Kondala District for at least six months. Individuals who were temporarily absent or unable to communicate were excluded.

2.3 Study design

A community- based cross- sectional study design was employed. The study was conducted over a period of 12 months, from October 2024 to October 2025.

2.4 Sample size determination and sampling technique

The required sample size was calculated using the formula for cross- sectional studies with a single proportion (Arsham, 2005):

$N = 0.25 / SE^2$

where SE = standard error of 5% (0.05). This gave N = 0.25 / 0.0025 = 100. To increase precision and account for possible non- responses, the sample size was doubled to 200 participants.

A multistage sampling technique was applied:

- **Stage 1 (District selection):** Kondala District was purposively selected due to accessibility and the absence of prior KAP studies.
- **Stage 2 (Kebele selection):** Two kebeles (the smallest administrative units) – Gaba Dafino 01 and Gaba Dafino 02 – were selected from the district using simple random sampling (lottery method).
- **Stage 3 (Household selection):** The calculated sample (200 households) was proportionally allocated to the two kebeles (100 each). Within each kebele, households were selected using a systematic random sampling technique. A list of all households was obtained from the kebele administration, and a sampling interval (k) was calculated by dividing the total number of households by 100. The first household was selected randomly, and then every k- th household was included until the required number was reached.

2.5 Data collection methods

Data were collected through face- to- face interviews using a structured, pre- tested questionnaire. The questionnaire was first developed in English, then translated into Afan Oromo (the native language of the study area) and back-translated to English to ensure consistency. The questionnaire consisted of four sections:

- **Section I (Socio-demographic characteristics):** 8 items (sex, age, education, occupation, household size, religion, residential kebele, dog ownership).
- **Section II (Knowledge about rabies):** 10 items covering awareness, cause, species affected, transmission routes, common transmitting animals, clinical signs, prevention with PEP, awareness of dog vaccination, vaccine availability, and dog bite reports.
- **Section III (Attitudes towards rabies):** 4 items regarding training received, fatality of rabies, belief in dog vaccination effectiveness, and perception of rabies as a serious public health problem.
- **Section IV (Practices related to rabies prevention and control):** 5 items on dog vaccination, dog management (free-roaming vs. confined), dog registration, action when an animal shows rabies signs, and first action after a dog bite.

The questionnaire was pre-tested on 20 households (not included in the final sample) in a neighbouring kebele to check clarity, comprehension, and flow. Modifications were made to wording as necessary. The interviews were conducted by the principal investigator and two trained veterinary nurses, each of whom received one day of training on interview techniques and ethical conduct.

2.6 Data management and analysis

After collection, data were checked for completeness and consistency. They were then entered into Microsoft Excel 2013, coded, and exported to STATA version 17 (StataCorp, College Station, TX, USA) for statistical analysis.

Scoring system: For each respondent, a knowledge score was calculated as the number of correct answers to the 10 knowledge questions (range 0–10). Similarly, attitude scores (range 0–4) and practice scores (range 0–5) were computed. Respondents who scored $\geq 60\%$ of the maximum possible score in each domain were categorised as having "good" knowledge/attitude/practice, while those with $<60\%$ were categorised as "poor". This threshold is consistent with previous KAP studies (Nejash & Endale, 2017; Digafe et al., 2015).

Statistical analysis: Descriptive statistics (frequencies, percentages, means) were used to summarise socio-demographic characteristics and KAP variables. For each KAP domain, bivariable logistic regression was first performed to identify independent variables with a p-value <0.2. These variables were then entered into a multivariable logistic regression model to adjust for potential confounders. The final model presented adjusted odds ratios (aOR) with 95% confidence intervals (CI) and p-values. Statistical significance was set at $p<0.05$. The fit of the logistic regression models was assessed using the Hosmer-Lemeshow goodness-of-fit test ($p>0.05$ indicated acceptable fit).

2.7 Ethical considerations

Ethical clearance was obtained from the Assosa University College of Agriculture and Veterinary Science (CAVS) Ethical Review Board (reference number: AU/CAVS/ERC/025/2024). Permission was also obtained from the Kondala District Administration and the West Wollega Zone Livestock and Fishery Resource Development Office. All participants were informed about the purpose of the study, the voluntary nature of participation, and their right to withdraw at any time without consequences. Verbal informed consent was obtained from each participant before the interview. Confidentiality was ensured by using unique identification codes instead of names, and data were stored on password-protected computers. Cultural and religious values were respected throughout the data collection process.

3. Results

3.1 Socio-demographic characteristics of study participants

A total of 200 household heads participated in the study, giving a response rate of 100%. Table 1 summarises their socio-demographic characteristics.

- **Sex:** The majority were male (115, 57.5%), with females comprising 42.5% (85).
- **Age:** The largest age group was 18–30 years (117, 58.5%), followed by 31–50 years (69, 34.5%). Only 14 participants (7.0%) were older than 50 years.
- **Educational status:** Illiteracy was common: 75 (37.5%) could not read or write. Primary school education was reported by 55 (27.5%), secondary school by 38 (19.0%), and higher education (diploma or above) by only 32 (16.0%).
- **Occupation:** Government employees constituted the largest occupational group (64, 32.0%), followed by unemployed (60, 30.0%), farmers (40, 20.0%), merchants (20, 10.0%), housewives (8, 4.0%), and others (8, 4.0%).
- **Household size:** 92 (46.0%) households had 1–3 members, 64 (32.0%) had 4–8 members, and 44 (22.0%) had more than 8 members.
- **Religion:** The majority were Muslim (132, 66.0%), followed by Protestant (36, 18.0%) and Orthodox Christian (32, 16.0%).
- **Residential kebele:** Respondents were equally distributed between Gaba Dafino 01 (100, 50.0%) and Gaba Dafino 02 (100, 50.0%).
- **Dog ownership:** Dog ownership was very high: 176 (88.0%) of households owned at least one dog, while only 24 (12.0%) did not own dogs.

Table 1: Socio-demographic characteristics of study respondents (N=200)

Variable	Category	Frequency (n)	Percentage (%)
Sex	Male	115	57.5
	Female	85	42.5
Age (years)	18–30	117	58.5
	31–50	69	34.5
	>50	14	7.0
Educational status	Higher education	32	16.0
	Secondary school	38	19.0
	Primary school	55	27.5
	Illiterate	75	37.5
Occupation	Government employee	64	32.0
	Unemployed	60	30.0
	Farmer	40	20.0

Variable	Category	Frequency (n)	Percentage (%)
	Merchant	20	10.0
	Housewife	8	4.0
	Other	8	4.0
Household size	1–3	92	46.0
	4–8	64	32.0
	>8	44	22.0
Religion	Protestant	36	18.0
	Orthodox	32	16.0
	Muslim	132	66.0
Residential kebele	Gaba Dafino 01	100	50.0
	Gaba Dafino 02	100	50.0
Dog ownership	Yes	176	88.0
	No	24	12.0

3.2 Knowledge of respondents towards rabies

Table 2 presents the responses to the ten knowledge questions.

- **Awareness of rabies:** Only 104 (52.0%) of respondents had ever heard of rabies; 96 (48.0%) had not.
- **Cause of rabies:** When asked "What causes rabies?", 116 (58.0%) correctly identified a virus. However, substantial misconceptions existed: 32 (16.0%) believed rabies was caused by starvation or thirst, 20 (10.0%) by spiritual causes, 28 (14.0%) by bacteria, and 4 (2.0%) said they did not know.
- **Species affected:** Regarding which species can be affected by rabies, 44 (22.0%) said dogs only, 64 (32.0%) said dogs and humans, and 92 (46.0%) correctly said humans and other domestic animals (e.g., cats, cattle).
- **Transmission to humans:** The question on transmission routes revealed a serious misconception: only 40 (20.0%) correctly identified "bite from an infected animal". Twelve (6.0%) said "contact with saliva on broken skin/mucous membranes", while the vast majority – 140 (70.0%) – believed that "eating infected meat" transmits rabies. Only 8 (4.0%) chose "all of the above".
- **Animals that commonly transmit rabies:** A majority, 128 (64.0%), correctly said "dogs only". 52 (26.0%) said "dogs and cats", and 20 (10.0%) said "other domestic animals".
- **Clinical signs of rabies in animals:** When asked about signs, 64 (32.0%) mentioned excessive salivation (foaming at the mouth), 20 (10.0%) mentioned sudden aggression or unusual calmness, and 116 (58.0%) correctly identified both signs.
- **Prevention with PEP:** All 200 respondents (100%) knew that rabies can be prevented after a bite through post-exposure prophylaxis (PEP).
- **Awareness of dog vaccination:** Only 112 (56.0%) were aware that dogs can be vaccinated against rabies; 88 (44.0%) were not.
- **Availability of rabies vaccine in the area:** A minority, 48 (24.0%), said the vaccine was always available; 120 (60.0%) said sometimes available; and 32 (16.0%) said never available.
- **Dog bite reports:** All 200 (100%) confirmed that dog bites had been reported in their community in the past year.
- **Overall knowledge score:** Based on the 60% threshold (≥6 correct answers out of 10), 137 (68.5%) of respondents had a "good" knowledge score, while 63 (31.5%) had a "poor" knowledge score.

Table 2: Knowledge assessment of respondents towards rabies (N=200)

Knowledge item	Response category	Frequency (n)	Percentage (%)
Aware of rabies?	Yes	104	52.0
	No	96	48.0
What causes rabies?	Virus	116	58.0
	Starvation/thirst	32	16.0
	Spiritual causes	20	10.0
	Bacteria	28	14.0
	I don't know	4	2.0
Species affected?	Dogs only	44	22.0
	Dogs and humans	64	32.0
	Humans and other domestic animals	92	46.0
Transmission to humans?	Bite from infected animal	40	20.0
	Contact with saliva on broken skin	12	6.0
	Eating infected meat	140	70.0
	All of the above	8	4.0
Common transmitting animals?	Dogs only	128	64.0
	Dogs and cats	52	26.0
	Other domestic animals	20	10.0
Clinical signs?	Excessive salivation	64	32.0
	Sudden aggression/calmness	20	10.0
	Both	116	58.0
PEP prevents rabies after bite?	Yes	200	100.0
Aware of dog vaccination?	Yes	112	56.0
	No	88	44.0
Vaccine availability?	Always available	48	24.0
	Sometimes available	120	60.0
	Never available	32	16.0
Dog bites reported in community?	Yes	200	100.0
Overall knowledge score	Good (≥60%)	137	68.5
	Poor (<60%)	63	31.5

3.3 Association between knowledge score and independent variables

Multivariable logistic regression was performed to identify factors independently associated with good knowledge (Table 3). The Hosmer-Lemeshow test indicated good model fit (χ^2=7.23, p=0.512).

- **Sex:** Male respondents were significantly more likely to have good knowledge compared to females (aOR = 2.61; 95% CI: 1.42–4.79; p=0.024).

- **Age:** Compared to respondents aged >50 years, those aged 18–30 years had dramatically higher odds of good knowledge (aOR = 25.79; 95% CI: 10.11–65.78; p=0.001). The 31–50 age group also had significantly higher odds (aOR = 24.52; 95% CI: 6.63–90.70; p=0.001).
- **Educational status:** Higher education was strongly associated with good knowledge. Compared to illiterate respondents, those with higher education had an aOR of 5.56 (95% CI: 1.66–18.62; p=0.033). Secondary school education also showed a significant association (aOR = 5.03; 95% CI: 1.55–16.32; p=0.007), but primary school education did not reach statistical significance (aOR = 2.38; 95% CI: 0.74–7.65; p=0.147).
- **Occupation:** No statistically significant association was found between occupation and knowledge score (all p>0.05).
- **Household size, religion, residential kebele, dog ownership:** None of these variables were significantly associated with knowledge in the multivariable model.

Table 3: Multivariable logistic regression for factors associated with good knowledge score (N=200)

Variable	Category	Good knowledge (n=137)	Poor knowledge (n=63)	aOR (95% CI)	p-value
Sex	Male	91 (66.4%)	24 (38.1%)	2.61 (1.42–4.79)	0.024
	Female	46 (33.6%)	39 (61.9%)	Ref	
Age	18–30	109 (79.6%)	8 (12.7%)	25.79 (10.11–65.78)	0.001
	31–50	23 (16.8%)	46 (73.0%)	24.52 (6.63–90.70)	0.001
	>50	5 (3.6%)	9 (14.3%)	Ref	
Education	Higher	28 (20.4%)	4 (6.3%)	5.56 (1.66–18.62)	0.033
	Secondary	21 (15.3%)	17 (27.0%)	5.03 (1.55–16.32)	0.007
	Primary	32 (23.4%)	23 (36.5%)	2.38 (0.74–7.65)	0.147
	Illiterate	56 (40.9%)	19 (30.2%)	Ref	
Occupation	Government	47 (34.3%)	17 (27.0%)	1.49 (0.69–3.21)	0.310
	Unemployed	39 (28.5%)	21 (33.3%)	1.05 (0.43–2.55)	0.916
	Farmer	29 (21.2%)	11 (17.5%)	1.84 (0.64–5.28)	0.255
	Merchant	12 (8.8%)	8 (12.7%)	1.66 (0.36–7.70)	0.518
	Housewife	5 (3.6%)	3 (4.8%)	1.66 (0.36–7.70)	0.518
	Other	5 (3.6%)	3 (4.8%)	Ref	

Note: aOR = adjusted odds ratio; CI = confidence interval; Ref = reference category. Variables not significant (p>0.05) in final model for knowledge: household size, religion, residential kebele, dog ownership (data not shown for brevity).

3.4 Attitude of respondents towards rabies

Table 4 summarises the attitude responses.

- **Training on rabies prevention:** Only 12 (6.0%) had ever received any training on rabies prevention; 188 (94.0%) had not.
- **Fatal nature of rabies:** Almost all respondents (196, 98.0%) correctly believed that rabies is always fatal if untreated. Only 4 (2.0%) answered "No" or "I don't know".
- **Prevention by dog vaccination:** A minority (52, 26.0%) believed that rabies can be prevented by vaccinating dogs. Twenty- four (12.0%) said "No", and the majority (124, 62.0%) said "I don't know".
- **Rabies as a serious public health problem:** Only 11 (5.5%) believed that rabies is a serious public health problem in their community. The vast majority (155, 77.5%) said "No", and 34 (17.0%) said "I don't know".
- **Overall attitude score:** Using the 60% threshold (≥3 positive attitudes out of 4), 131 (65.5%) had a "good" attitude score, while 69 (34.5%) had a "poor" attitude score.

Table 4: Attitudes of respondents towards rabies (N=200)

Attitude item	Response	Frequency (n)	Percentage (%)
Received training on rabies prevention?	Yes	12	6.0
	No	188	94.0
Is rabies always fatal if untreated?	Yes	196	98.0
	No / I don't know	4	2.0
Can rabies be prevented by vaccinating dogs?	Yes	52	26.0
	No	24	12.0
	I don't know	124	62.0
Is rabies a serious public health problem in your community?	Yes	11	5.5
	No	155	77.5
	I don't know	34	17.0
Overall attitude score	Good (≥60%)	131	65.5
	Poor (<60%)	69	34.5

3.5 Association between attitude score and independent variables

Multivariable logistic regression for good attitude (Table 5) showed:

- **Age:** Respondents aged 18–30 years had significantly higher odds of good attitude compared to those >50 years (aOR = 8.56; 95% CI: 4.26–17.18; p=0.001). Those aged 31–50 years also had higher odds (aOR = 9.90; 95% CI: 2.97–32.97; p=0.001).
- **Educational status:** Higher education was strongly associated with good attitude (aOR = 10.91; 95% CI: 2.27–52.41; p=0.003). Secondary education (aOR = 12.50; 95% CI: 2.72–57.53; p=0.001) and primary education (aOR = 7.96; 95% CI: 1.76–35.97; p=0.007) were also significant compared to illiterates.
- **Sex, occupation, household size, religion, residential kebele, dog ownership:** None of these

were significantly associated with attitude in the final model (all p>0.05).

Table 5: Multivariable logistic regression for factors associated with good attitude score (N=200)

Variable	Category	Good attitude (n=131)	Poor attitude (n=69)	aOR (95% CI)	p-value
Age	18–30	99 (75.6%)	18 (26.1%)	8.56 (4.26–17.18)	0.001
	31–50	27 (20.6%)	42 (60.9%)	9.90 (2.97–32.97)	0.001
	>50	5 (3.8%)	9 (13.0%)	Ref	
Education	Higher	30 (22.9%)	2 (2.9%)	10.91 (2.27–52.41)	0.003
	Secondary	22 (16.8%)	16 (23.2%)	12.50 (2.72–57.53)	0.001
	Primary	30 (22.9%)	25 (36.2%)	7.96 (1.76–35.97)	0.007
	Illiterate	49 (37.4%)	26 (37.7%)	Ref	

Note: Other variables not significant (sex, occupation, household size, religion, residential kebele, dog ownership) are omitted for brevity.

3.6 Practices of respondents towards rabies

Table 6 presents the practice-related responses.

- **Dog vaccination:** Out of 176 dog owners, not a single one (0%) had vaccinated their dog(s) against rabies. The 24 respondents who owned no dogs were not applicable.
- **Dog management:** Among dog owners, 115 (57.5% of total, or 65.3% of owners) let their dogs roam freely. Sixty-one (30.5% of total, or 34.7% of owners) kept their dogs indoors or confined. (Percentages of total: free-roaming 57.5%, confined 30.5%, no dog 12.0%.)
- **Dog registration:** No dog owner had officially registered their dog with local authorities. All 176 (88.0% of total) said "No" (the 24 non-owners were not applicable).
- **Action when an animal shows signs of rabies:** Among all respondents, 168 (84.0%) said they would kill the animal immediately. Only 8 (4.0%) would tie/restrain it, and the remaining 24 (12.0%) had no dog or were unsure.
- **First action after a dog bite:** The most common response was "apply herbal remedies" (120, 60.0%). Only 60 (30.0%) would visit a health centre immediately. Twenty (10.0%) would use holy water/spiritual treatment or "wash the wound with soap and water" (which was grouped in the same category as spiritual treatment because respondents often combined them).
- **Overall practice score:** Based on the 60% threshold (≥3 positive practices out of 5), 136 (68.0%) had a "good" practice score, while 64 (32.0%) had a "poor" practice score.

Table 6: Practices of respondents towards rabies prevention and control (N=200)

Practice item	Response	Frequency (n)	Percentage (%)
Vaccinated your dog(s) against rabies?	Have no dog	24	12.0
	No	176	88.0
	Yes	0	0.0
How do you manage your dog(s)?	Have no dog	24	12.0
	Let them roam freely	115	57.5
	Keep indoors/confined	61	30.5
Is your dog officially registered?	Have no dog	24	12.0
	No	176	88.0
	Yes	0	0.0
Action if animal shows rabies signs?	Tie/restrain	8	4.0
	Kill the animal	168	84.0
	Do nothing / have no dog	24	12.0
First action after dog bite?	Visit health centre	60	30.0
	Apply herbal remedies	120	60.0
	Holy water/spiritual/wash wound	20	10.0
Overall practice score	Good (≥60%)	136	68.0
	Poor (<60%)	64	32.0

3.7 Association between practice score and independent variables

Multivariable logistic regression for good practice (Table 7) showed:

- **Sex:** Males were significantly more likely to have good practices compared to females (aOR = 2.51; 95% CI: 1.37–4.62; p=0.003).
- **Age:** Compared to those >50 years, respondents aged 18–30 years had much higher odds of good practice (aOR = 12.17; 95% CI: 5.80–25.52; p=0.001). The 31–50 age group also had significantly higher odds (aOR = 7.36; 95% CI: 2.25–24.11; p=0.001).
- **Educational status:** Higher education was the strongest predictor: aOR = 27.90 (95% CI: 3.45–225.72; p=0.002). Secondary education (aOR = 22.28; 95% CI: 2.83–175.19; p=0.003) and primary education (aOR = 12.87; 95% CI: 1.65–100.20; p=0.015) were also significant compared to illiterates.
- **Residential kebele:** Respondents from Gaba Dafino 01 kebele had better practice scores than those from Gaba Dafino 02 (aOR = 2.33; 95% CI: 1.26–4.29; p=0.007).
- **Occupation, household size, religion, dog ownership:** No significant associations were found (all p>0.05).

Table 7: Multivariable logistic regression for factors associated with good practice score (N=200)

Variable	Category	Good practice (n=136)	Poor practice (n=64)	aOR (95% CI)	p-value
Sex	Male	88 (64.7%)	27 (42.2%)	2.51 (1.37–4.62)	0.003
	Female	48 (35.3%)	37 (57.8%)	Ref	
Age	18–30	103 (75.7%)	14 (21.9%)	12.17 (5.80–25.52)	0.001

Variable	Category	Good practice (n=136)	Poor practice (n=64)	aOR (95% CI)	p-value
	31–50	26 (19.1%)	43 (67.2%)	7.36 (2.25–24.11)	0.001
	>50	7 (5.1%)	7 (10.9%)	Ref	
Education	Higher	31 (22.8%)	1 (1.6%)	27.90 (3.45–225.72)	0.002
	Secondary	20 (14.7%)	18 (28.1%)	22.28 (2.83–175.19)	0.003
	Primary	32 (23.5%)	23 (35.9%)	12.87 (1.65–100.20)	0.015
	Illiterate	53 (39.0%)	22 (34.4%)	Ref	
Residential kebele	Gaba Dafino 01	77 (56.6%)	23 (35.9%)	2.33 (1.26–4.29)	0.007
	Gaba Dafino 02	59 (43.4%)	41 (64.1%)	Ref	

Note: Occupation, household size, religion, and dog ownership were not significant and are omitted.

4. Discussion

This study is the first to assess community knowledge, attitudes, and practices regarding rabies in Kondala District, Western Ethiopia. Our findings reveal substantial gaps that place the community at high risk of rabies mortality, despite high awareness of rabies fatality.

4.1 Knowledge about rabies

Only 52.0% of respondents were aware of rabies. This low level of awareness is comparable to reports from other rural Ethiopian districts: 55.3% in Munesa District (Nejash & Endale, 2017), 51.4% in South Gondar (Bihon et al., 2020), and 52.6% in Debretabor (Alie et al., 2015). However, it is substantially lower than awareness levels in urban settings, such as Addis Ababa (83.4%; Ali et al., 2013) and Bahir Dar (73.8%; Guadu et al., 2014). This urban-rural disparity likely reflects better access to mass media, health education, and veterinary services in cities. In Kondala, where radio signal is intermittent and television is rare, information about rabies may not reach most households.

Regarding the cause of rabies, 58.0% correctly identified a virus, which is higher than the 24.1% reported in Bahir Dar (Guadu et al., 2014) but similar to findings in Dessie (49.6%; Gebeyaw & Teshome, 2016) and Debark (63.5%; Yalemebrat et al., 2016). However, the persistence of misconceptions – 16.0% blaming starvation/thirst, 10.0% spiritual causes, and 14.0% bacteria – indicates that traditional beliefs still dominate etiological explanations. Such misconceptions are dangerous because they lead to inappropriate prevention measures (e.g., feeding a dog to prevent "starvation rabies") and reliance on spiritual healers.

The most alarming knowledge gap concerned rabies transmission. Only 20.0% correctly identified animal bites as the main route, while 70.0% believed that eating infected meat transmits rabies. This is dramatically lower than reports from Munisa District (88.7%; Nejash & Endale, 2017) and New York City (71.9%; Eidson et al., 2004). The widespread belief in meat-borne transmission has serious implications: it may lead to unnecessary slaughter of livestock, consumption of potentially infective tissues (though rabies is not transmitted via properly cooked meat), and diversion of attention from the real route – bites. This misconception must be specifically addressed in health campaigns.

Encouragingly, all respondents knew that PEP can prevent rabies after a bite. This 100% awareness is higher than in many other Ethiopian studies (e.g., 80.2% in Adigrat; Ahmed et al., 2021; 73.7% in Dilla; Beyene, 2022). It suggests that even in remote areas, the message about seeking medical treatment after a bite has penetrated to some extent. However, as we will see in the practice section, knowledge does not translate into action.

Awareness of dog vaccination (56.0%) was moderate, but zero actual vaccination (discussed below) indicates a major gap between knowing and doing. Vaccine availability was perceived as "sometimes available" by 60.0% – a serious barrier in a disease where timely PEP is life-saving.

4.2 Factors associated with good knowledge

Our multivariable analysis identified male sex, younger age, and higher education as significant predictors of good knowledge. The strong effect of age (aOR = 25.8 for 18–30 year olds vs. >50 years) is consistent with studies from Gondar (Jemberu et al., 2013) and Addis Ababa (Deressa et al., 2010). Younger people in Ethiopia are more likely to have attended school, use mobile phones, and interact with health extension workers. The higher knowledge among males may reflect their greater exposure to veterinary services and community meetings, as men are typically responsible for livestock and dog management in this patriarchal society.

Education was a powerful driver: higher education increased knowledge odds nearly six-fold. This aligns with global evidence that formal education enhances comprehension of health messages (Rago et al., 2024; Gebrewold et al., 2016). The fact that primary education was not significantly associated (p=0.147) suggests that only secondary and higher education provide the literacy and critical thinking skills needed to understand rabies biology and transmission.

4.3 Attitudes towards rabies

The finding that 98.0% of respondents knew rabies is fatal is very positive and similar to Debark (99.0%; Yalemebrat et al., 2016). This high awareness of fatality should theoretically motivate preventive action. However, only 26.0% believed that dog vaccination can prevent rabies, and only 5.5% considered rabies a serious public health problem in their community. This disconnect – knowing the disease is deadly but not believing it is a local problem – is a classic example of the "optimism bias" (also known as "it won't happen to me"). It mirrors findings from Mada Walabu District, where only 27% had a positive attitude towards dog vaccination (Desa et al., 2024).

The very low level of perceived seriousness (5.5%) is particularly concerning. If community members do not see rabies as a relevant threat, they will not support dog vaccination campaigns or change their bite-management behaviours. This perception may stem from the fact that rabies deaths are relatively rare events in any single village, and when they occur, they may be attributed to other causes (e.g., evil spirits or poisoning). Health education must aim to make the risk tangible, for example by sharing stories of rabies victims from nearby communities.

Interestingly, only 6.0% had ever received any training on rabies prevention. This reveals a complete absence of structured rabies education in the district. Given that 88.0% of households own dogs, this is a massive missed opportunity.

4.4 Factors associated with good attitude

As with knowledge, younger age and higher education were strongly associated with positive attitudes. The odds ratios for attitude were even larger than for knowledge (e.g., aOR = 12.5 for secondary education vs. illiterates). This suggests that education not only imparts facts but also shapes beliefs about disease prevention. Similar findings have been reported in the Amhara region (Yimer et al., 2019) and Addis Ababa (Gebrewold et al., 2022). Surprisingly, sex was not significant for attitude, unlike for knowledge and practice. This may indicate that while men know more and do more, their underlying beliefs about the importance of rabies are similar to women's.

4.5 Practices related to rabies prevention and control

The practice results are the most troubling aspect of this study. **Zero dog vaccination** – not a single dog owner had ever vaccinated their dog – is catastrophic for rabies control. This finding is consistent with reports from Mizan Aman (0%; Zegeye, 2024) and rural Chiro (Paulos et al., 2003) but contrasts sharply with higher coverage in other Ethiopian towns: 42% in Gondar (Digafe et al., 2015), 56.9% willingness to register in Mekelle (Hagos et al., 2020), and 79% in Sri Lanka (Matibag et al., 2009). The absence of vaccination in Kondala is almost certainly due to lack of service availability: there is no regular dog vaccination campaign, and veterinary services are focused on livestock. Until free or subsidised annual campaigns are established, herd immunity (target 70% coverage) will remain a distant dream.

Dog management practices are also poor: 57.5% allow their dogs to roam freely, which facilitates rabies transmission between dogs and from dogs to humans and livestock. Free-roaming dogs are also more likely to be involved in road accidents, fights, and bite incidents. None of the dogs were registered, meaning there is no database for rabies surveillance or vaccination tracking.

The response to an animal showing rabies signs is deeply problematic: 84.0% would kill the animal immediately. While understandable – people want to eliminate the threat – this practice contravenes WHO recommendations that such animals should be confined and observed for 10 days. Only if the animal dies or shows progressive neurological signs should it be euthanised and tested. Immediate killing not only destroys the opportunity for diagnosis but also increases the risk of exposure during the killing process (e.g., saliva contact). This practice has been reported elsewhere in Ethiopia: 87.7% in Mogor Town (Girma et al., 2024) and 52.5% in Mersa Town (Gabeyehu et al., 2020).

Post-bite practices are alarmingly inappropriate. Only 30.0% would visit a health centre for PEP. The majority (60.0%) would first apply herbal remedies, and 10.0% would use holy water or spiritual treatments. This heavy reliance on traditional medicine is much higher than in Jimma Town (7.4%; Rago et al., 2024) and Bahir Dar (9.4%; Guadu et al., 2015). Several factors likely explain this: deep cultural trust in herbalists, lack of awareness that PEP is highly effective, perceived high cost or distance of health facilities, and anecdotal reports that "grandma's remedy" has "worked" in the past (survivorship bias – people who die are not around to tell their stories). Immediate wound washing with soap and water, which can reduce rabies risk by up to 50% (Nejash et al., 2017), is hardly ever practised. This is a simple, low-cost intervention that must be promoted.

4.6 Factors associated with good practice

The predictors of good practice mirrored those for knowledge, with the addition of residential kebele (Gaba Dafino 01 had better practices than 02). The extremely high aOR for higher education (27.90) underscores that education is the most powerful lever for changing behaviour. This makes intuitive sense: educated individuals are more likely to understand causal relationships, trust biomedical explanations, and overcome traditional beliefs. The kebele difference may be due to proximity to the health centre (Gaba Dafino 01 contains the town centre) or unmeasured differences in community leadership.

4.7 Comparison with global and national targets

The WHO and WOAH have set a global goal of zero human rabies deaths by 2030 through the "United Against Rabies" initiative. Key milestones include achieving 70% dog vaccination coverage in endemic areas, ensuring PEP access for all bite victims, and improving community awareness. Kondala District is far from these targets: 0% dog vaccination, 30% PEP seeking, and only 52% basic awareness. Urgent, multi-sectoral action (One Health approach) is needed.

4.8 Strengths and limitations

Strengths: This is the first KAP study in Kondala District, providing baseline data for future interventions. The sample size (200) was calculated to be representative, and the multistage random sampling minimised selection bias. The use of a pre-tested, locally translated questionnaire enhanced validity. Multivariable regression adjusted for confounders.

Limitations: The cross-sectional design precludes causal inferences. Social desirability bias may have led some respondents to overreport positive attitudes or underreport traditional remedy use, though we tried to minimise this by assuring confidentiality. The study only covered two kebeles; results may not be generalisable to the entire district, although we have no reason to expect major differences. Finally, the knowledge score threshold of 60% is arbitrary, but it is standard in KAP literature.

5. Conclusions and Recommendations

5.1 Conclusions

This comprehensive assessment of community KAP towards rabies in Kondala District, Western Ethiopia, reveals a situation of high risk and missed opportunities. Key conclusions are:

1. **Knowledge is inadequate:** Only half the community has heard of rabies; only one-fifth knows that bites are the main transmission route; misconceptions about meat-borne transmission are pervasive.
2. **Attitudes are not translating into action:** While almost everyone knows rabies is fatal, very few believe dog vaccination works or that rabies is a local problem.
3. **Practices are dangerous:** Zero dog vaccination, free-roaming dogs, immediate killing of suspect

animals, and 60% reliance on herbal remedies after bites create a perfect storm for continued rabies transmission and human deaths.

4. **Vulnerable groups:** Older individuals, women, and illiterate people have significantly worse KAP and should be prioritised in interventions.

Without immediate, coordinated action, rabies will continue to kill people and animals in Kondala District, and the goal of zero human rabies deaths by 2030 will remain unattainable.

5.2 Recommendations

Based on our findings, we propose the following targeted recommendations.

For the Kondala District Health Office and Agriculture Office:

- **Launch a sustained, multi-channel rabies awareness campaign** using:
  - Local radio (community radio if available)
  - Mobile cinema/video shows in marketplaces and schools
  - Religious leaders (imams and priests) to deliver key messages during gatherings
  - Health extension workers during home visits
  - Printed posters in Afan Oromo in health posts and schools

Essential messages:

  - Rabies is caused by a virus, transmitted by bites (not by eating meat).
  - Washing a bite wound with soap and water for 15 minutes immediately after a bite reduces risk by 50%.
  - After washing, go to a health centre for PEP – it is free and saves lives.
  - Vaccinating dogs is the only way to eliminate rabies at source.
  - Do not kill a biting dog; confine and observe for 10 days.

- **Establish free annual mass dog vaccination campaigns** in every kebele, timed to coincide with the dry season when dogs are easier to gather. Aim for at least 70% coverage. Use temporary vaccination posts and door-to-door teams.
- **Train all health extension workers** to recognise rabies symptoms, provide proper wound care, refer bite victims for PEP, and collect data on dog bites.
- **Discourage traditional remedies** through community dialogue – not by confrontation, but by presenting evidence that herbal treatments do not prevent rabies, while PEP does. Involve traditional healers as allies.

For the Oromia Regional Health Bureau and Livestock Agency:

5. **Ensure uninterrupted PEP supply** at all primary health centres and hospitals in the West Wollega Zone, with buffer stocks to cover seasonal surges.
6. **Integrate rabies education into the primary school curriculum** (science and health classes) so that children become agents of change in their families.
7. **Fund a pilot dog registration and population management programme** in Gaba Dafino town as a model for the district.

For the Ethiopian Federal Ministry of Health and Ministry of Agriculture:

8. **Include Kondala District in the national rabies control priority list** and allocate dedicated budget for dog vaccination, surveillance, and awareness.
9. **Strengthen the rabies surveillance system** by requiring mandatory reporting of animal bite cases and suspect animal rabies, and by subsidising laboratory confirmation (FAT).

For future research:

10. Conduct a qualitative study (focus groups, in-depth interviews) to understand the deep-seated reasons for preferring traditional remedies – this will inform behaviour change strategies.
11. Perform a cost-effectiveness analysis of mass dog vaccination in similar rural Ethiopian districts to generate evidence for policy makers.
12. Repeat this KAP survey after two years of interventions to measure impact.

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