



## Research Article



# Investigating Rabies Prevention and Control: A Study of Knowledge, Attitudes, and Practices in Jimma Town, South-Western Ethiopia

Ramla Rago , Gazali Abafaji , and Sadik Zakir Abadura\* 

School of Veterinary Medicine, College of Agriculture and Veterinary Medicine, Jimma University, Jimma, Ethiopia

\* **Corresponding author:** Sadik Zakir, School of Veterinary Medicine, College of Agriculture and Veterinary Medicine, Jimma University, Jimma Ethiopia  
Email: [sadikethiovet@gmail.com](mailto:sadikethiovet@gmail.com)

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### ABSTRACT

**Introduction:** Ethiopia has the second highest number of human rabies deaths among African countries. However, the lack of public awareness regarding rabies prevention and control is a major obstacle in combating this disease. To address this issue, the current study was conducted in Jimma Town, southwestern Ethiopia, to assess the knowledge, attitude, and practice (KAP) of households regarding rabies and its associated factors.

**Materials and methods:** The current community-based cross-sectional study was carried out, involving a total of 421 participants. The KAP of the respondents was evaluated using principal component analysis and ranked accordingly.

**Results:** Out of the 421 study participants, 53% were female and 63.4% were male. Among the participants, 62.3% demonstrated an adequate level of knowledge, 51% exhibited a positive attitude, and 43% practiced effective prevention and control measures against rabies. On the other hand, younger and male participants were found to have positive attitudes towards rabies. The study revealed that individuals with lower levels of education, specifically those who had not completed college as well as the unemployed and those without dogs had poor knowledge attitudes, and practices about rabies.

**Conclusion:** These findings highlight the need to improve the understanding and awareness of rabies within the community.

## 1. Introduction

Rabies is one of the most serious zoonotic diseases and the most feared viral encephalitis. It affects the central nervous system of all warm-blooded animals, including humans<sup>1</sup>. Globally human mortality from canine rabies is estimated to be 60,000<sup>2</sup>. The case fatality rate is 100% once a clinical sign is developed. It also causes about 3.7 million disability-adjusted life years (DALYs) burden and 8.6 billion USD in economic losses per year in the world<sup>3</sup>. In developing countries, domestic dogs are the major source of infection and responsible for about 99% of all human rabies cases<sup>4</sup>. It is estimated that around half of the global human population lives in canine rabies-endemic countries and is at risk of exposure. Ethiopia has the second highest rabies death rate in the world, estimated that 2,700 people die with the disease each year<sup>5</sup>. The magnitude of the problem is higher in center cities like Addis Ababa linked to the presence of a large population of stray dogs and associated factors<sup>6</sup>. Ethiopian Public Health Institute report on human rabies exposure and

death, Tigray (1439 and 1, Amhara 1083 and 9, Oromia 286 and 15, Benishangul-Gumuz 73 and 3, SNNPR 32 and 1, Somalia 7 and 0 and Gambela 4 and 2) exposure and case, respectively indicates the nationwide distribution of the disease<sup>7</sup>. With respect to Jimma Town, the studies showed that on average three victims visit Jimma Town anti-rabies health center per day for post-exposure prophylaxis excluding victims going to traditional healers<sup>8</sup>. Thirteen deaths due to rabies were reported from Jimma Health Center between mid-October 2012 and mid-January 2013<sup>8</sup>. In December 2013, a massive outbreak of rabies occurred and claimed the lives of 10 individuals in the Shabe Sombo district of Jimma Zone<sup>9</sup>. From a retrospective study conducted in Jimma Town Health Center between 2009-2012 the highest number of rabies-suspected cases (20.4%) were recorded in Jimma Town followed by Limmu Cossa (11.1%) whereas the smallest cases were recorded in Nonno benja (0.7%). The high burden of rabies-associated mortalities in most developing countries

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predicts the existence of ineffective human and animal rabies prevention and control programs<sup>10</sup>. Rabies is the most fatal of all infectious diseases and remains a great Socio-economic problem in Ethiopia. In developing countries where financial resources are limited and there are numerous competing interests, there is a need for quantitative data on the public health burden and costs of diseases to support intervention prioritization<sup>7</sup>. Disease prevention and control practice studies can be used for arranging public health awareness campaigns and also result in the provision of baseline data for planning, application, and evaluation of national disease control programs<sup>11</sup>. As a result of changing attitudes and practices, disease burden can be minimized as seen in the case of different disease conditions<sup>1</sup>. Understanding community perceptions of cause, mode of transmission, symptoms, treatment, and possible intervention measures and factors associated with the Rabies prevention and control practice in the study area is an important step toward developing strategies aimed at controlling the disease and determining the level of implementation of planned activities in the future<sup>11</sup>. Despite the endemic nature of rabies in Ethiopia, little is known about the level of community awareness in Ethiopia in general and in Jimma town in particular. Therefore, to efficiently increase awareness, the knowledge gap in the community should be identified and targeted. Thus, this study aimed to investigate existing levels of knowledge, attitude, and practice as well as determinants of knowledge, attitudes, and practice towards rabies prevention and control in the endemic setting of Jimma town.

## 2. Materials and Methods

### 2.1. Description of the study area

The study was conducted in Jimma Town which is the capital city of Jimma zone of Oromia regional state, Southwestern Ethiopia. Jimma town is located 352 km Southwest of Addis Ababa. The town's geographical coordinates are 7°41' N latitude and 36° 50' E longitude and an elevation within the town boundary ranges from 1700 to 2000 mail (ESIA, 2011). The Jimma zone currently has a total population of 2,831,919. Within this, the population of Jimma town is 207,573, with females comprising 50.1% and males 49.9%. The town is situated in the Woyna-daga climatic zone, characterized by hot and humid weather conditions. It is subdivided into 17 kebeles, the smallest administrative units in Ethiopia.

### 2.2 Study design

A cross-sectional study design was conducted from December 2022 to August 2023 to assess the knowledge, attitude, and practice of the community towards rabies in Jimma Town.

### 2.3. Sample size and sampling methods

The sample size was determined using the single population proportion formula. Assuming that the

proportions of knowledge level, attitude level, and practice level are 56.1%, 52.3%, and 61.3%, respectively, with a margin of error of 5% and a confidence level of 95%, the calculated sample sizes for knowledge, attitude, and practice (KAP) were 377, 383, and 364 respectively. Therefore, the largest sample size among the three, which is 383, was deemed appropriate. To account for a 10% non-response rate, 10% of 383 was added, resulting in a final sample size of 421.

Furthermore, since the town is divided into 17 kebeles, which are the smallest governmental administrative units, five kebeles were randomly selected using a lottery method. These kebeles are Ginjo, Mendera-Kochi, Awetu Mendera, Hora Gibe, and Mentina, representing 30% of the total kebeles. From the total number of households in the selected kebeles, which is 15,595, the sample size of 421 was proportionally allocated to each selected kebele based on the size of their households. The sampling unit, which is the sample households, was then selected using a systematic random sampling technique. In each chosen household, one adult person over the age of 18 was interviewed. In cases where an eligible respondent was not available in a given household, an immediate replacement was made by selecting an individual from the next household until the required sample size was achieved. Overall, this methodology ensures a representative sample that accurately reflects the KAP levels of the population under study.

The survey included all household heads or their spouses aged 18 and above, residing as permanent residents in the study area for at least six months. However, individuals in this age group who faced communication issues and those unwilling to participate were excluded from the study.

### 2.4. Survey methodology

Before the interview, the respondents were briefed about the purpose of the study and asked for their consent. Only voluntary participants were involved in the study. A questionnaire was designed based on consultation with researchers who had conducted KAP surveys elsewhere. Data were collected by face-to-face interviews using a structured and pre-tested questionnaire. The survey encompassed diverse demographic aspects, including gender, various age groups, different occupations, and varying levels of education. The questionnaire was first prepared in English and translated to Afaan Oromo for appropriateness and easiness in approaching the study participants.

For validation of the questionnaire, a sample of 15 randomly selected individuals in the study area who were not included in the main study was used. The questionnaire was assessed for its understandability, clarity, completeness, reliability, and sociocultural acceptability and then edited as required. It had different sections including socio-demographic factors like age, sex, marital status, monthly income, educational status pet ownership, and occupation. Moreover, the questionnaire also incorporated knowledge questions on rabies (description of the disease, cause(etiology) mode of transmission, clinical manifestations, prognosis (outcome), range of

species affected, and practice questions towards rabies prevention and control strategies (dog vaccination, dog restraint, timely seeking post-exposure prophylaxes, first aid, action for suspected rabid dog and carcasses management) collected from the selected households.

### 2.5. Data management and analysis

The data obtained were exported to Statistical Package for Social Science (SPSS) Version 23 for statistical analysis. Descriptive statistics was used for calculating the frequency distribution of the socio-demographic and economic factors. Knowledge, attitude, and practice of respondents were generated using principal component analysis. In multivariate analysis, variables with p values less than 0.05 were considered statistically significant.

## 3. Results

### 3.1. Socio-demographic character of the participants

In this study, a total of 421 community members were interviewed to learn more about their backgrounds and characteristics. All participants answered the questionnaire, giving us a complete picture of their socio-demographic information. Out of all the participants, 53% were female and 47% were male. This means that more women took part in the study than men. The respondents were divided into three age groups of 18-40, 41-59, and 60 years and above. The largest group was the 18-40 age range, making up 63.4% of the participants. The 41-59 age group accounted for 30% of the participants, while those aged 60 and above made up 6.6%. When it comes to marital status, 69.4% of the participants were married, 25.6% were unmarried, and 5% fell into other categories. This finding showed that the majority of the participants were married. When it comes to education, 9% of the participants had no formal education, 24.3% had elementary education, 32.5% had secondary education, and 34.2% had college and above education. This result showed that the majority of the participants had at least a secondary education. The participants asked about the size of their families. 35.3% of them came from families with one to three members, while 51.5% came from families with four to six members. Only 13.3% of the participants came from families with more than six members. When it comes to occupation, the majority of the participants were employed (32.3%), followed by private workers (26%), housewives (22.6%), students (11.8%), labor workers (6.5%), and farmers (0.8%). Out of all the participants, 53.5% did not have a defined income, while 46.5% had a regular income. Lastly, the participants were asked if they owned dogs and 35.5% of them had a dog, while 64.5% did not. Overall, the socio-demographic characteristics of the participants are summarized in Table 1.

### 3.2. Knowledge of respondents about the causes, host range, clinical signs, and transmission of rabies

Knowledge of respondents regarding the cause, host

range, clinical signs, and transmission of rabies was comprehensively summarized in Table 2. It is noteworthy that the majority of the respondents, specifically 419 individuals (99.5%), were aware of the existence of rabies. However, a mere 129 respondents (30.6%) possessed knowledge about the causative agents responsible for rabies. Surprisingly, 230 participants (54.6%) admitted their lack of knowledge regarding the causative agent, while 62 individuals (14.7%) held misconceptions, erroneously believing that starvation and thirst were the root causes of rabies. While the majority of respondents demonstrated awareness of rabies, there were notable gaps in their knowledge.

### 3.3. Knowledge of respondents on transmission, prevention, and control methods

The information pertaining to the transmission, prevention, and control methods of rabies has been succinctly summarized in Table 3. Among the participants in the study, a significant majority of 284 individuals (67.5%) demonstrated awareness that rabies can affect both humans and other domestic animals. Additionally, 173 participants (41%) specifically identified dogs as a major source of rabies. Furthermore, 222 respondents (52.8%) displayed knowledge regarding the transmission of rabies from animals to humans. However, a noteworthy proportion of respondents, 298 individuals (70.8%), mistakenly believed that dog bites were the sole method of transmission to humans. Considering control measures, 50.2% of respondents highlighted the significance of vaccination. Additionally, 27.6% of participants suggested the restriction or elimination of stray dogs as a viable method. Notably, 42% of respondents emphasized the importance of raising awareness, while 41.6% acknowledged the effectiveness of implementing all the aforementioned measures.

**Table 1.** Socio-demographic characters of the respondents on the KAP of rabies in Jimma town, Ethiopia from December 2022 to August 2023

Variables	Categories	Frequency	Percentage
Gender	Male	198	47
	Female	223	53
Age	18-40	267	63.5
	41-50	126	30
	>60	28	6.5
Marital status	Married	292	69.4
	Unmarried	108	25.4
	Others	21	5.2
Educational status	No formal education	38	9
	Elementary	102	24
	Secondary	135	32.5
Household size	College and above	145	34.2
	1-3	148	34.3
	4-6	217	52.5
Current occupation	>6	56	13.2
	Employed	136	32.3
	Privet work	109	26.1
Monthly income	Housewife	96	22.6
	Student	50	11.8
Dog ownership	Labour worker	27	7.8
	Regular	196	46.5
Dog ownership	Not defined	225	53.5
	Yes	149	35.5
	No	272	64.6

**Table 2.** Knowledge of respondents in relation to cause, host range, clinical signs, and transmission of rabies in Jimma town, Southwest Ethiopia, from December 2022 to August 2023

Parameters	Categories	Frequency	Percentage
Do you know rabies?	Yes	419	99.53
	No	2	0.47
Do you know the causative agent of rabies?	Virus	129	30.6
	Starvation/stress	62	14.7
Do you know species affected with Rabies?	Do not know the causative agent of rabies?	230	54.6
	Humans	4	1
Do you know the clinical signs of rabies in dogs?	Domestic/wild animals	111	26.4
	All animals human	284	67.5
	Do not know Species affected with Rabies	21	4.7
	Change of behavior	83	20
Do you know the clinical signs of rabies in humans?	Salivation	106	25.2
	Loss of appetite	9	2.1
	All	190	45.1
	Do not know Clinical signs of rabies in dog	33	7.8
Do you know the clinical signs of rabies in humans?	Change of behavior (psychopathic, convulsion)	147	34.9
	Salivation	32	7.6
	Fear of water	2	0.5
	All	92	21.8
Do you know the clinical signs of rabies in humans?	Do not know the clinical signs of rabies in human	148	35.2

**3.4. Factors associated with the respondents’ knowledge**

The findings of this study indicated that 62.5% of the respondents demonstrated adequate knowledge regarding the subject matter, while 37.5% were found to have a poor knowledge score. A detailed analysis of the data is presented in Table 4. According to the multivariable analysis, there were significant associations between the knowledge of respondents about rabies and educational level, occupation, and pet ownership ( $p < 0.05$ ). Firstly, individuals with a higher educational status, such as those who completed high school or college and above, exhibited a greater likelihood of possessing adequate knowledge (OR = 0.476, 0.264-0.859) compared to illiterate individuals. Similarly, being unemployed (OR = 0.439, 0.272-0.706)

**Table 3.** Knowledge of rabies transmission and its prevention and control methods in Jimma town, Ethiopia from December 2022 to August 2023

Variables	Categories	Frequency	percentage
Do you know how can dogs acquire rabies?	Bitten by a rabid dog	286	67.4
	Starvation and trust	62	14.7
	Dirty food and environment	17	4.5
	Eating rabid dog meat	56	13.4
Do you know how can a person acquire rabies?	Bitten by a rabid dog	298	70.8
	Bitten and licked on broken skin	382	90.7
Prevention routines	Bitten and licked on broken skin and Contamination with saliva on intact skin also	34	8.1
	Vaccinating dogs	65	15.3
	Do not allow dogs to roam freely	174	41.4
	Both	146	34.7
Do you know the frequency of vaccination?	Teaching peoples	34	8.0
	Every year	110	26.2
	Every 6 months	21	5
	Do not know the Frequency of vaccination	290	68.8
Do you know how can we control Rabies?	Vaccinating dogs	211	50.2
	Restrict /killing stray dogs	116	27.6
	Teaching people	42	10
	All	175	41.6

and not owning a dog (OR = 0.586, 0.375-0.915) were also found to be associated with poor knowledge about rabies.

**3.5. Community attitude on rabies**

The results of the study indicated that the majority of respondents (96%) view rabies as a fatal disease. Among the participants, 325 (77%) consider rabies to be treatable, while 319 (75.8%) believe it is preventable. Furthermore, 67% of the respondents identified children as being at a higher risk of contracting rabies, compared to older individuals. In terms of preferred actions to be taken when someone is bitten by an animal suspected of having rabies, 94.2% of participants responded that post-exposure vaccination is the appropriate course of action. Only 5.8%

**Table 4.** Factors associated with knowledge of respondents on rabies transmission and its prevention and control methods in Jimma town, Ethiopia from December 2022 to August 2023 based on multivariate logistic regression analyses.

Variable	Categories	Univariate analysis		Multivariate analysis	
		Crude OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Gender	Male	0.75(0.509-1.124)	0.167	0.686(0.445-1.057)	0.088
	Female				
Age	<55	1.335(0.887-2.010)	0.166	1.208(0.775-1.884)	0.404
	>55				
Marital status	Married	0.734(0.734-1.123)	0.154	1.076(0.654-1.769)	0.773
	Unmarried				
Educational status	Illiterate/elem./seco	0.460 (0.262-0.809)	0.007	0.476(0.264-0.859)	0.014
	College and above.				
Family size	1-3	1.08(0.921-1.280)	0.306		
	>4				
Occupation	Employed				
	Unemployed	0.483(0.324-0.721)	0.001	0.439(0.272-0.706)	0.001
Income	Regular	1.332(0.881-1.202)	0.174	1.147(0.733-1.793)	0.548
	Not Defined				
Pet ownership	Yes				
	No	0.555(0.361-0.854)	0.007	0.586(0.375-0.915)	0.001

CI: Confidence interval, OR: Odds ratio

**Table 5.** Community attitudes regarding rabies in Jimma town, Ethiopia from December 2022 to August 2023

Variables	Categories	Frequency	Percentage
The incubation period of rabies	Immediate		
	<40 days	195	46.3
	<90 days		
More risky population	It depends	35	8.3
	Children	282	67
	Old peoples	139	33
Preferred action taken for exposed people	Post-exposure vaccination	365	86.7
	Tradition treatment	16	3.8
	Both	35	8.3
	Do not know the preferred action taken for exposed people	5	1.2
First aid for bitten for bite victim	wash with soap and water	136	32.3
	Clean with alcohol	50	11.8
	Apply herbal extract	133	31.5
	Do nothing	102	24
Time to take anti-rabies vaccine when exposed	Immediately	350	83.2
	Any time	71	16.9
Easily treatable after onset of clinical signs	Agree	136	32.3
	Disagree	285	67.7
Rabies is preventable by dog vaccination	Agree	198	47
	Disagree	223	53
Eliminating stray or confining dogs helps prevent rabies	Agree	401	95.2
	Disagree	20	4.8
Rabies is reportable	Agree	333	79.1
	Disagree	88	20.9
Dog ownership	Yes	116	27
	No	305	72.4
Vaccination history	Yes	37	32
	No	79	68
Exposure to biting incidence	Yes	239	56.8
	No	182	43.2
Action taken the biting dogs	Observed for 10 days	22	5.3
	Killed instantly	198	47
	Do nothing	201	47.7

of participants mentioned traditional treatments as a viable option. Moreover, only 15.4% of participants believed that rabies can be prevented through vaccination, while 27.6% believed that eliminating stray dogs or confining dogs could help prevent the spread of rabies. Interestingly, 23.5% of respondents believed that giving herbal products to dogs could also prevent rabies. The attitudes and practices of the respondents towards rabies are summarized in [Table 5](#).

### 3.6. Attitude towards suspect rabid animal sightings

Respondents were asked about what actions should be taken when they encounter animals with symptoms similar to rabies. The answers varied, with 28.2% of respondents suggesting immediate killing of the dog, 10.5% suggesting capturing and observing the dog, and 7.5% suggesting

doing nothing or walking away from the suspected rabid animal. Interestingly, there has been a significant increase in the number of people who would report a rabid suspected dog sighting to authorities, with 58% choosing this option and 42% taking action themselves. Among those who would report to authorities, the majority mentioned that they would report the suspect animals to village officials (kebeles; 29%). [Table 6](#) summarizes the results of the KAP survey on attitudes towards suspect rabid animal sightings.

Since village officials are considered the frontline in small communities, they must be educated on the importance of their role in preventing and controlling rabies.

### 3.7. Factors associated with attitude of respondents

[Table 7](#) presents the results of the multivariable logistic

**Table 6.** Attitude towards suspect rabid animal sightings in Jimma town, Ethiopia from December 2022 to August 2023

Variables	Categories	Frequency	percentage
What to do if an animal develops symptoms of rabies	Immediately killing	119	28.2
	Seeking drugs from a vet clinic	193	45.8
	Capture and observe under control	45	10.8
	Consult traditional healers	30	7.2
	Giving herbals/slaughtering	32	7.5
Rabies is reportable	Agree/strongly agree	333	79.1
	Disagree/strongly disagree	88	20.9
Where to report suspected animals	Village officials (kebeles)	122	29
	City/Municipal	46	11
	Health Unit	76	18
	Taking action by themselves (killing)	177	42

**Table 7.** Factors associated with attitudes of respondents towards rabies in Jimma Town, Ethiopia from December 2022 to August 2023

variable	Categories	Univariate analysis		Multivariate analysis	
		Crude OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Gender	Male	1.47(1.003-2.166)	0.048	1.558(1.036-2.344)	0.033
	Female				
Age	<55	1.462(0.987-2.176)	0.058	1.543(1.014-2.350)	0.043
	>55				
Marital status	Married	0.709(0.466-1.079)	0.108	0.941(0.582-1.520)	0.803
	Unmarried				
Educational status	Illiterate/elementary/secondary	0.563(0.318-0.997)	0.049	0.483(0.268-0.876)	0.016
	Collage and above				
Family size	1-3	0.834(0.573-0.939)	0.087		
	>4				
Occupation	Employed	0.665(0.452-0.979)	0.039	0.816(0.519-1.283)	0.379
	Un employed				
Income	Regular	1.318(0.885-1.962)	0.174	1.202(0.787-1.836)	0.394
	Not defined				
Pet ownership	Yes	1.300(0.868-1.946)	0.203		
	No				

CI: Confidence interval, OR: Odds ratio

regression analysis, which examines the relationship between community attitude and socio-demographic characteristics. This analysis revealed that the positive attitude score is significantly influenced by gender, age, and educational status. Interestingly, male respondents exhibit a 1.55 times higher positive attitude score compared to females (OR = 1.558, CI = 95%). This finding highlighted the gender disparity in attitudes towards the subject under study. Furthermore, the study revealed that younger participants display a significantly higher positive attitude towards rabies compared to their older counterparts. The odds of having a higher positive attitude score among younger respondents are approximately 1.54 times greater than among older respondents (OR = 1.543, CI = 95%). This finding suggests that age plays a crucial role in shaping attitudes towards rabies. On the other hand, individuals with lower educational attainment, such as illiterates and those with only an elementary level of education, tend to have a negative attitude towards the subject (OR = 0.483, CI = 95%). This finding emphasizes the impact of education on attitude formation. Moreover, the association between education level and attitude score demonstrates a statistically significant difference ( $p < 0.05$ ). This underscores the importance of educational background in shaping community attitudes. In summary, the multivariable logistic regression analysis reveals that gender, age, and educational status significantly influence community attitudes toward rabies. These findings shed light on the factors that contribute to the formation of attitudes within the community, providing valuable insights for future interventions and awareness campaigns.

### 3.8. The practice of participants toward rabies

This study revealed that out of the total participants, 116 individuals (27.3%) reported having contact with dogs and cats. Among them, 28 participants (6.7%) had taken the initiative to vaccinate their pets. Additionally, among the 235 respondents (55.8%) who had either been bitten by a

dog or had a family member bitten by a dog, only 149 individuals (35.4%) sought medical attention after the incident. Surprisingly, 63 individuals (15%) neglected to seek any medical assistance, while 31 individuals (7.4%) opted for traditional healers. In terms of first aid practices, it was found that 209 participants (49.6%) were knowledgeable in providing initial medical assistance. Among them, 135 individuals (32.1%) preferred washing the wound with water and soap, 47 individuals (11.2%) chose to clean the wound using alcohol, and 131 individuals (31.1%) relied on herbal products and other traditional methods. Table 8 provides a comprehensive summary of the community's overall practices. This study sheds light on the prevalence of contact with dogs and cats among participants, as well as their response to dog bites. It is concerning to note that a significant number of individuals did not seek proper medical attention after being bitten, opting for neglected or traditional healing methods instead.

### 3.9. Factors associated with practice

Interestingly, male respondents exhibited significantly positive practices in rabies prevention compared to their female counterparts. Male respondents were found to have a 1.63 times higher effective practice score than females (OR = 1.63, 95% CI: 1.073-2.46). Additionally, pet owners demonstrated significantly higher effective practices in rabies prevention and control compared to non-pet owners. The odds of having an adequate practice score among pet owner respondents were 3.5 times higher than those without pets (OR = 3.515, 95% CI: 2.222-5.56). Furthermore, the multivariable analysis revealed that poor practice scores were significantly associated with educational status. Respondents with no formal education or who attended primary school were more likely to have poor practice compared to their counterparts (OR = 0.344, 95% CI: 0.170-0.661) with a statistically significant difference ( $P = < 0.05$  in rabies prevention and control).

**Table 8.** Vaccine history, practice against suspected animal bite victims, and duty of dog owners in Jimma town, Ethiopia from December 2022 to August 2023

Variables	Categories	Frequency	Percentage
Have you ever heard anyone fell victim to rabies in your life?	Yes	235	55.8
	No	186	44.2
After exposure	Seeking medical care (PEP)	149	35.4
	Went to a traditional healer	31	7.4
	Do nothing	63	15
Behaviour with suspected dog	Observed for 10 days	21	5
	Killed immediately	197	46.7
	Nothing	17	4
Practice first aid	Yes	209	46.8
	No	212	53.2
First aid material	Wash with soap & water	135	32.1
	Clean using alcohol	47	11.2
	Apply herbal extracts and other traditional method	131	31.1
How to dispose of a rabid animal carcass?	Bury/burn	314	74.6
	Throw it away	107	25.4
	Submit dogs for vaccination	211	50
How should dogs be taken care of?	Do not allow dogs to roam freely	118	28
	No need of rearing	180	42.8
	Provide dogs with shelter/food	106	25.17

#### 4. Discussion

This study has revealed that the community in Jimma town is well-informed about rabies, with 99.5% of the respondents reporting that they have heard about the disease. This finding aligns with previous studies conducted by, Digafe et al.<sup>12</sup> in the Gondar Zuria District, and Yalembrat et al.<sup>13</sup> in the Debark District, North Gondar, Ethiopia. These studies reported 98.6%, 99.3%, and 100% awareness rates toward rabies respectively. However, the awareness rate in Jimma town was higher compared to other studies. For instance, a survey conducted in Pakistan by Touseef et al.<sup>14</sup> reported an awareness rate of only 68.7% among the community regarding knowledge, attitudes, and practices related to animal bites and rabies. Similarly, a study conducted among residents of Addis Ababa by Ali et al.<sup>15</sup> reported an awareness rate of 83%. In terms of the preferred action taken when someone is bitten by an animal, the majority of participants (94.2%) reported that they would seek post-exposure vaccination. This finding is consistent with a study, conducted in Burkina Faso by Savadogo et al.<sup>16</sup> which reported a higher proportion of 94% of individuals seeking medical attention at a hospital in case of dog bites.

In the current study, it was found that 14.7% of respondents had a misunderstanding about the cause of rabies, which is starvation and thirst. However, this percentage is significantly lower compared to the results of previous studies conducted in Debark District, North Gondar, Ethiopia (63.5%)<sup>13</sup>. This discrepancy could be attributed to differences in awareness levels among the study areas. Only approximately 30.6% of the 421 participants correctly identified the cause of rabies.

Furthermore, in this study, it was found that 67.5% of respondents were aware that rabies can affect both humans and other domestic animals. However, a study conducted by Guadu et al.<sup>17</sup> in Bahir Dar town reported a lower percentage (21.4%), while a higher percentage (71.9%) was reported in the city of New York, USA<sup>18</sup>. The

variation in these results could be attributed to differences in the availability of different host ranges, levels of awareness, and educational status within the communities. Moreover, in the current study, it was found that only 32.1% of respondents reported that they would wash a wound with soap and water as a first aid measure for a bitten human. This percentage is significantly lower compared to the findings of a study conducted in Debark District (76.4%)<sup>13</sup> but it is consistent with the results of studies conducted in Gondar Zuria district (30.7%)<sup>12</sup> and a rural community in Gujarat, India (31.1%)<sup>19</sup>. This disparity may be attributed to the level of awareness within the community. The treatment for rabies is inexpensive, easily accessible, and feasible for all individuals to utilize. Research has shown that washing rabies-infected wounds with soap and water can increase survival rates by 50%<sup>20</sup>. However, the society is not effectively implementing this practice. Failure to wash wounds has been found to be responsible for a five-fold increase in the risk of developing rabies<sup>21</sup>.

In the present study, 35.4% of participants expressed a preference for post-exposure vaccination for individuals who have been bitten, and 83.1% of respondents stated that this vaccination should be administered immediately after exposure. Similarly, a study conducted in Bahar Dar town reported a 55.7% response rate in favor of immediate post-exposure vaccination<sup>7</sup>. The World Health Organization (WHO) also recommends washing wounds and administering vaccination promptly after contact with a suspected rabid animal, as this can prevent nearly 100% of rabies-related death<sup>10</sup>. Furthermore, it is worth noting that children are perceived to be at a higher risk of contracting rabies, as mentioned by 67% of the respondents. This could be attributed to the fact that children often engage in close contact with dogs, both at home and in public spaces. Conversely, older individuals tend to be more aware of the dangers posed by rabies and are more likely to seek medical care when necessary<sup>22</sup>.

Moreover, it is crucial to address the issue of poor

practices in relation to rabies prevention. This is primarily a result of low dog vaccination coverage, which stands at a mere 32% compared to the World Health Organization's recommendation of at least 70% coverage for herd immunity [17]. The findings of the current study indicate that 53% of participants do not believe in the effectiveness of vaccinating dogs for rabies prevention. This lack of belief may be attributed to the fact that the primary source of information for 77.9% of respondents is their family or neighbors, rather than health professionals. Those who relied on personal contacts for information were found to be 3.2 times more likely to have poor practices regarding rabies prevention. In terms of the respondents' knowledge of clinical signs associated with dog bites, the study revealed a lack of understanding across all groups. Only a small percentage of participants were aware of the various clinical signs, such as changes in behavior (20%), salivation or drooling (25%), loss of appetite (2.1%), and running without reason (25.9%). Similarly, when it came to clinical signs in humans, such as altered personality (34.9%), salivation (7.6%), and hydrophobia (0.5%), the level of knowledge was also low, with only 17.3% of respondents providing comprehensive answers. These findings highlight a deficiency in knowledge regarding clinical symptoms compared to similar studies conducted in Nepal of South Asia [22]. The responses received for altered personality, salivation, hydrophobia, and aerophobia ranged from 36%. It is evident that there is a pressing need to improve the understanding and awareness of rabies prevention and clinical signs within the community.

The present finding suggests that the lack of knowledge regarding clinical signs of rabies could potentially pose a risk to the prevention and control of the disease. Therefore, it is crucial to raise community awareness about the clinical signs of rabies. Additionally, the study revealed a lack of comprehensive knowledge regarding rabies prevention practices, such as the appropriate disposal of carcasses. Alarmingly, a quarter of respondents (25.4%) admitted to disposing of the carcasses of rabid animals, a common practice in other parts of the country.

According to the World Health Organization (WHO), mass dog vaccination is the most effective measure to control rabies and prevent human deaths. While the majority of respondents acknowledged the importance of dog vaccination and expressed willingness to vaccinate their own dogs, only 32.7% reported having previously vaccinated their animals. This reflects a lack of effective rabies control programs in the area. Most respondents stated that dog vaccinations are not regularly conducted in their community. This finding is consistent with a study conducted in Debretabor town [23]. It is possible that government employees, with their higher educational backgrounds, have better access to health information, enabling them to adopt more effective preventive measures. This finding aligns with a study conducted in India, suggesting that a positive attitude plays a crucial role in driving effective preventive practices [24]. Respondents who lacked formal education and only attended primary

schools were found to have poor practices compared to their counterparts. This finding aligns with previous KAP studies conducted in Dedo district, Addis Ababa, Debretabor town [15,23,25]. The possible explanation for this trend is that individuals with higher levels of education have better access to information and are more likely to comprehend disease prevention and control measures. Schools play a crucial role in equipping individuals with comprehensive knowledge about diseases.

The results of this study indicate that the total mean scores for KAP were 62.5%, 51%, and 43%, respectively. Households with adequate knowledge about rabies accounted for 62.5% of the sample, which is lower than the studies conducted in Sri Lanka (89.6%) and Tanzania (96%) [26,27]. The possible reasons for this difference could be due to low health promotion, particularly regarding rabies in this study area. Among the households in this study, 51% had a positive attitude about rabies, which was lower than the study conducted in Indonesia (96%) [28]. This difference probably might be explained by the lack of health education about rabies at the study site. Among the household heads included in this study, it was found that only 43% demonstrated effective practices toward rabies prevention. This finding is notably lower than a previous study conducted in Mekele, which reported a rate of 61.3% [6]. The disparity in these results could potentially be attributed to cultural differences between the two regions.

Furthermore, the association between education level and overall knowledge about rabies was found to be statistically significant. Specifically, individuals who were illiterate or had only completed elementary education exhibited lower levels of knowledge regarding rabies. This finding is consistent with similar studies conducted in Arizona, USA [29]. Conversely, individuals with higher levels of education tend to possess greater knowledge about rabies as a study conducted in North Carolina indicated [30], while illiterate individuals tend to have less knowledge about the disease [31]. This discrepancy can be attributed to the fact that educated individuals have better access to information and are more capable of comprehending the complexities of the diseases.

Individuals with a strong knowledge base and those who own dogs are more likely to exhibit effective practices in preventing rabies, in comparison to those without canine companions. This finding aligns with a study conducted in Tanzania [27]. These communities demonstrate a commendable level of awareness regarding rabies, particularly in terms of vaccination and dog care, which contributes to their ability to effectively prevent and control the disease. Conversely, respondents with a negative attitude are more prone to engaging in poor preventive practices. This highlights the crucial role that a positive attitude plays in promoting effective practices. It is important to note that this study did not address all the questions pertaining to KAP. Despite its limitations, this study holds significant value as it sheds light on the level of knowledge, attitude, and practices within the Jimma town community regarding rabies.



## 5. Conclusion

This study has revealed that although people are familiar with rabies, there is still a gap in their practices toward rabies prevention and control measures. Most participants were unaware of the importance of vaccinating dogs, recognizing clinical symptoms, understanding the incubation period, identifying causative factors, and administering proper first aid. Additionally, a significant portion of the population prefers to consult traditional healers and use local remedies instead of seeking medical facilities to treat dog bite injuries. Therefore, the following issues must be addressed by key stakeholders. Conduct awareness-raising campaigns targeting specific groups such as females, illiterate and under-college students, older age groups, unemployed communities, individuals without dogs, and children. These campaigns can effectively prevent unnecessary deaths. Disseminate simple yet impactful messages through government and community networks, such as vaccinate your dogs and cats against rabies, immediately wash your wound with water and soap, seek anti-rabies vaccination after a bite from a rabid animal," and "all mammals suffer from rabies, so bury or burn carcasses of dead rabid animals." These messages can greatly improve community practices.

## Declarations

### Competing interests

The authors declare that they have no conflict of interest regarding the publication of this paper.

### Authors' contributions

Ramla Rago generated the idea and wrote the paper. Gazali Abafaji and Sadik Zakir supervised the manuscript work and took part in revising the manuscript. All authors read and approved the final version of the manuscript and conceived the study.

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### Availability of data and materials

All data related to this study are available in this article.

### Ethical considerations

The ethical concerns, including plagiarism, permission to publish, misconduct, data fabrication and falsification, double publishing, submission, and redundancy have all been checked by the authors.

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## References

- Torres-Pérez ME, Reyes-Cortés IB, Romero-Ramos EM, Reyna-Osorio DA, Serrano-Murillo M, Martínez-Manjarrez JA, et al. Rabies, the cause of fatal encephalitis. *Salud Publica Mex.* 2022; 65(1): 93-98. DOI: [10.21149/13899](https://doi.org/10.21149/13899)
- Adedeji AO, Okonko IO, Eyarefe OD, Adedeji OB, Babalola ET, Ojezele MO, et al. An overview of rabies-history, epidemiology, control and possible elimination. *Afr J Microbiol Res.* 2010; 4(22): 2327-2338. Available at: [https://academicjournals.org/article/article1380371404\\_Adedeji%20et%20al.pdf](https://academicjournals.org/article/article1380371404_Adedeji%20et%20al.pdf)
- Zhu JY, Jian PAN, and Yuan-qiang Lu. A case report on indirect transmission of human rabies. *J Zhejiang Univ Sci B.* 2015; 16(11): 969. DOI: [10.1631/jzus.b1500109](https://doi.org/10.1631/jzus.b1500109)
- Jackson AC. Human rabies: A 2016 update. *Curr Infect Dis Rep.* 2016; 18: 38. DOI: [10.1007/s11908-016-0540-y](https://doi.org/10.1007/s11908-016-0540-y)
- Mulugeta Y, Lombamo F, Alemu A, Bekele M, Getahun DS, Akilu M, et al. Assessment of the current rabies situation and its management in epidemic areas of southern Ethiopia. *Highlights BioSci.* 2020; 3: 1-7. DOI: [10.36462/H.BioSci.20212](https://doi.org/10.36462/H.BioSci.20212)
- Hagos WG, Muchie KF, Gebru GG, Mezgebe GG, Reda KA, and Dachew BA. Assessment of knowledge, attitude and practice towards rabies and associated factors among household heads in Mekelle city, Ethiopia. *BMC Public Health.* 2020; 20(1): 57. DOI: [10.1186/s12889-020-8145-7](https://doi.org/10.1186/s12889-020-8145-7)
- Beyene TJ, Mourits MCM, Kidane AH, and Hogeveen H. Estimating the burden of rabies in Ethiopia by tracing dog bite victims. *PLoS One.* 2018; 13(2): e0192313. DOI: [10.1371/journal.pone.0192313](https://doi.org/10.1371/journal.pone.0192313)
- Kabeta T, Deresa B, Tigre W, Ward MP, and Mor SM. Knowledge, attitudes and practices of animal bite victims attending an anti-rabies health center in Jimma Town, Ethiopia. *PLoS Negl Trop Dis.* 2015; 9(6): e0003867. DOI: [10.1371/journal.pntd.0003867](https://doi.org/10.1371/journal.pntd.0003867)
- Hiwot G, Tewelde T, Sime AG, Deresa B, Tafese W, Hajito KW, et al. Community health seeking behavior for suspected human and animal rabies cases, Gomma District, Southwest Ethiopia. *PLoS One.* 2016; 11(3): e0149363. DOI: [10.1371/journal.pone.0149363](https://doi.org/10.1371/journal.pone.0149363)
- World Health Organization (WHO). WHO expert consultation on rabies: WHO TRS N°982. 2nd report. World Health Organization; 2013. Available at: <https://www.who.int/publications/i/item/WHO-TRS-982>
- Mendoza-Cano O, Hernandez-Suarez CM, Trujillo X, Diaz-Lopez HO, Lugo-Radillo A, Espinoza-Gomez F, et al. Cost-effectiveness of the strategies to reduce the incidence of dengue in Colima, México. *Int J Environ Res.* 2017; 14(8): 890. DOI: [10.3390/ijerph14080890](https://doi.org/10.3390/ijerph14080890)
- Digafe RT, Kifelew LG, and Mechesso AF. Knowledge, attitudes and practices towards rabies: Questionnaire survey in rural household heads of Gondar Zuria District, Ethiopia. *BMC Res Notes.* 2015; 8(1): 400. Available at: <https://bmresnotes.biomedcentral.com/articles/10.1186/s13104-015-1357-88>
- Yalemebrat N, Bekele T, and Melaku M. Assessment of public knowledge, attitude and practices towards rabies in Debark Woreda, North Gondar, Ethiopia. *J Vet Med Anim Health.* 2016; 8(11): 183-192. Available at: <https://academicjournals.org/journal/JVMAH/article-full-text-pdf/FEC974661288.pdf>
- Ahmed T, Hussain S, Zia UR, Rinchen S, Yasir A, Ahmed S, et al. Knowledge, attitude and practice (KAP) survey of canine rabies in Khyber Pakhtunkhwa and Punjab Province of Pakistan. *BMC Pub Health.* 2020; 20(1): 1293. DOI: [10.1186/s12889-020-09388-9](https://doi.org/10.1186/s12889-020-09388-9)
- Ali A, Ahmed EY, and Sifer D. A study on knowledge, attitude and practice of rabies among residents in Addis Ababa, Ethiopia. *Ethiop Vet J.* 2013; 17(2): 19-35. DOI: [10.4314/evj.v17i2.1](https://doi.org/10.4314/evj.v17i2.1)
- Savado M, Tialla D, Ouattara B, Dahourou LD, Ossebi W, Iboudo SG, et al. Factors associated with owned-dogs' vaccination against rabies: A household survey in Bobo Dioulasso, Burkina Faso. *Vet Med Sci.* 2021; 7(4): 1096-1106. DOI: [10.1002/vms3.468](https://doi.org/10.1002/vms3.468)
- Guadu T, Shite A, Chanie M, Bogale B, and Fentahun T. Assessment of knowledge, attitude and practices about rabies and associated factors: In the case of Bahir Dar town. *Glob Vet.* 2014; 13(3): 348-354. Available at: [https://www.idosi.org/gv/gv13\(3\)14/12.pdf](https://www.idosi.org/gv/gv13(3)14/12.pdf)
- Soun VV, Eidson M, Wallace BJ, Drabkin PD, Richard GJ, Cantiello LK,

- et al. Antemortem diagnosis of New York human rabies case and review of US cases. *Int J Biomed Sci.* 2006; 2(4): 434. PMID: <https://pubmed.ncbi.nlm.nih.gov/23675013>
19. Singh US, and Choudhary SK. Knowledge, attitude, behavior and practice study on dog-bites and its management in the context of prevention of rabies in a rural community of Gujarat. *Indian J Community Med.* 2005; 30(3): 81-83. Available at: [https://journals.lww.com/ijcm/Abstract/2005/30030/Knowledge,\\_Attitude,\\_Behavior\\_and\\_Practice\\_Study.4.aspx](https://journals.lww.com/ijcm/Abstract/2005/30030/Knowledge,_Attitude,_Behavior_and_Practice_Study.4.aspx)
  20. Ghorani M, Eslami F, and Jafari G. The first case report of rabies in a grey wolf (*Canis lupus*) in Chaharmahal and Bakhtiari Province (Iran). *Vet Med Sci.* 2022; 8(3): 1300-1304. DOI: <https://doi.org/10.1002/vms3.755>
  21. Abedi M, Haftcheshmeh SM, Bashar R, Kesharwani P, Samadi M, and Sahebkar A. Rabies vaccine: Recent update and comprehensive review of in vitro and in vivo studies. *Process Biochem.* 2023; 124: 201-220. DOI: [10.1016/j.procbio.2022.11.011](https://doi.org/10.1016/j.procbio.2022.11.011)
  22. Pal P, Yawongsa A, Bhusal TN, Bashyal R, and Rukkwamsuk T. Knowledge, attitude, and practice about rabies prevention and control: A community survey in Nepal. *Vet World.* 2021; 14(4): 933-942. DOI: [10.14202/vetworld.2021.933-942](https://doi.org/10.14202/vetworld.2021.933-942)
  23. Alie A, Assefa A, Derso S, and Ayele B. Assessment of knowledge, attitude and practice on rabies in and around Debretabor, South Gondar, Northwest Ethiopia. *Int J Basic Appl Virol.* 2015; 4(1): 28-34. Available at: [https://idosi.org/ijbav/4\(1\)15/4.pdf](https://idosi.org/ijbav/4(1)15/4.pdf)
  24. Subedi S, Adhikari K, Regmi D, Sharma HK, Bolakhe N, Kandel M, et al. Assessment of community knowledge and practices towards rabies prevention: A cross-sectional survey in Bharatpur, Chitwan, Nepal. *Zoonotic Dis.* 2023; 3(3): 203-214. DOI: [10.3390/zoonoticdis3030017](https://doi.org/10.3390/zoonoticdis3030017)
  25. Abdela N, Midekso B, Jabir J, and Abdela W. Knowledge, attitudes and practices towards rabies in Dedo district of Jimma zone, southwestern Ethiopia: A community based cross-sectional study. *Int J Med Sci.* 2017; 9(5): 61-71. Available at: <https://academicjournals.org/journal/IJMMS/article-full-text-pdf/2DCB3CC64168.pdf>
  26. Matibag GC, Ohbayashi Y, Kanda K, Yamashina H, Kumara WRB, Perera ING, et al. A pilot study on the usefulness of information and education campaign materials in enhancing the knowledge, attitude and practice on rabies in rural Sri Lanka. *J Infect Dev Ctries.* 2009; 3(1): 55-64. DOI: [10.3855/jidc.106](https://doi.org/10.3855/jidc.106)
  27. Sambo M, Lembo T, Cleaveland S, Ferguson HM, Sikana L, Simon C, et al. Knowledge, attitudes and practices (KAP) about rabies prevention and control: A community survey in Tanzania. *PLoS Negl Trop Dis.* 2014; 8(12): e3310. DOI: [10.1371/journal.pntd.0003310](https://doi.org/10.1371/journal.pntd.0003310)
  28. Widayastuti MDW, Bardosh KL, Basri SC, Basuno E, Jatikusumah A, Arief RA, et al. On dogs, people, and a rabies epidemic: Results from a sociocultural study in Bali, Indonesia. *Infect Dis Poverty.* 2015; 4: 30. DOI: [10.1186/s40249-015-0061-1](https://doi.org/10.1186/s40249-015-0061-1)
  29. McCollum AM, Blanton JD, Holman RC, Callinan LS, Baty S, Phillips R, et al. Community survey after rabies outbreaks, Flagstaff, Arizona, USA. *Emerg Infect Dis.* 2012; 18(6): 932-938. DOI: [10.3201/eid1806.111172](https://doi.org/10.3201/eid1806.111172)
  30. Palamar MB, Peterson MN, Deperno CS, and Correa MT. Assessing rabies knowledge and perceptions among ethnic minorities in Greensboro, North Carolina. *J Wildl Manage.* 2013; 77(7): 1321-1326. DOI: [10.1002/jwmg.593](https://doi.org/10.1002/jwmg.593)
  31. Herbert M, Basha R, and Thangaraj S. Community perception regarding rabies prevention and stray dog control in urban slums in India. *J Infect Public Health.* 2012; 5(6): 374-380. DOI: [10.1016/j.jiph.2012.05.002](https://doi.org/10.1016/j.jiph.2012.05.002)