Science Journal of Public Health
2025, Vol. 13, No. 1, pp. 17-34
https://doi.org/10.11648/j.sjph.20251301.13

Research Article

Perceptions and Behavioral Practices Concerning Rabies Among Rural Populations in Senegal, with a View to Adjusting Individual and Collective Preventive Policies and Measures

Amadou Ibra Diallo[1, 2, *], Khardiatou Barro[3], Fatoumata Binetou Diongue[1, 2], Mouhamadou Faly Ba[3], Adama Sow[1, 2], Mamadou Moustapha Ndiaye[3], Lamine Gaye[1, 2], Ibrahima Ndiaye[1, 2], Mbayang Ndiaye[1, 2], Oumar Bassoum[1, 2], Jean Augustin Di ègane Tine[1, 2], Nd ève Mar ème Sougou[1, 2], Mayassine Diongue[1, 2], Mamadou Makhtar Mback é L èye[1, 2], Adama Faye[1, 2], Ibrahima Seck[1, 2]

[1]Department of Preventive Medicine and Public Health Faculty of Medicine, Pharmacy and Odontology, Cheikh Anta Diop University, Dakar, Senegal

[2]Institute of Health and Development, Dakar, Senegal

[3]Faculty of Medicine, Pharmacy and Odontology, Cheikh Anta Diop University, Dakar, Senegal

Abstract

Introduction: Rabies is a 100% fatal disease once it has been confirmed. In 2020, it was estimated at more than 60,000 deaths worldwide. Hence this study of the knowledge, attitudes and practices of the population of Niakhene in Senegal, with a view to producing evidence for behavioral change. *Methodology:* This was a cross-sectional, descriptive and analytical survey of subjects aged 18 and over living in the commune of Niakhene. A sample of 300 individuals was drawn from a two-stage cluster survey stratified by age and sex. The data collected concerned knowledge of the signs of the disease, the vector, modes of transmission, vaccination attitudes and preventive measures taken in the event of bites. Analysis was performed using R 4.2.2 software. *Results:* The average age of the respondents was 35.3 ±16.9 years. They were female, married and not attending school in 52.3%, 65.7% and 67.7% of cases respectively. It was noted that 40% of respondents thought rabies was suspected in the presence of a behavioral disorder and 36% in the event of a dog bite. Of the 22 people who owned a dog, none had been vaccinated. Less than one per cent said that the wound should be washed with soap and water. The main source of information about rabies was friends and family (69.3%). Improved knowledge was associated with advancing age, with 25-39-year-old 4.6 times more likely (95% CI [2.2-10.1]), 40-59-year-old 8.8 times more likely [2.9-30.4] and over 60-year-old 3.6 times more likely [1.3-10.8]) than under 25-year-old. Those with secondary education or higher (ORaj = 6.28 [2.2-19.5]) and who had been made aware of rabies by friends and family (ORaj = 18.8 [9.42-38.0]) were more likely to have better knowledge of rabies. In terms of attitudes, good knowledge of rabies (ORaj = 2.48 [1.45-4.26]) was associated with vaccinating the dog. Similarly, good knowledge of rabies (ORaj = 3.23 [1.56-6.84]) and the fact of vaccinating one's dog (ORaj = 12.4 [5.96- 27.8]) were associated with the fact that vaccination would prevent rabies. Good practice was influenced by better knowledge (ORaj =4.41 [2.00-9.87]) and a positive attitude towards vaccinating the dog (ORaj = 2.63 [1.23- 5.52]). *Conclusion:* It would be imperative for human and

*Corresponding author: amadouibra.diallo@ucad.edu.sn (Amadou Ibra Diallo), dialloamadouibra@gmail.com (Amadou Ibra Diallo)

Received: 18 December 2024; **Accepted:** 6 January 2025; **Published:** 17 January 2025

animal medicine authorities to work together in a One Heath approach to propose communication strategies not only to increase knowledge but also to adopt good practice to improve prevention against the most common and most serious zoonotic diseases.

Keywords

Rabies, Perceptions, Behavioral, Practices, Population, Senegal

1. Introduction

From the Latin "rabies" meaning "violence" in Sanskrit, rabies is one of the most serious and feared viral zoonoses in the world. It is an infectious disease present on every continent, caused by a virus belonging to the Lyssavirus genus and the Rhabdoviridae family [1, 2]. Rabies is transmitted by the bite, scratch or licking of a wound by a rabid animal [2]. It causes encephalitis, which almost always results in death when it is declared. [3]

Rabies is a neglected, notifiable tropical disease, endemic in Asia and Africa, but often under-reported in certain regions. In 2020, the WHO has estimated that 60,000 people will die from rabies worldwide. The majority of deaths are attributable to Asia (59.6%) and Africa (36.4%), which accounts for 21,476 annual human deaths [4]. The economic costs of rabies are estimated at 8.6 billion US dollars [5] an amount likely to increase with more than 2.5 million people at risk of exposure [3, 6]. To reduce this burden, a global call is for the elimination of dog-transmitted human rabies by 2030, encouraging many countries to invest in mass vaccination of dogs [7].

In Africa, one person dies of rabies every 20 minutes, and it most often affects children [8]. There have been reports of dogs being imported from Europe, which may have an impact on the estimated dog population [9-11]. As a result, in many African countries, statistics on the vectors, and even the pathology, are still inadequate, and the number of dogs is still too low [12] consequently, epidemiological data are scattered [13]. This also reflects the under-reporting of cases of animal rabies.

In Senegal, 39 cases of rabies were reported between 2009 and 2014 [6]. Rabies is a notifiable disease and part of integrated surveillance [14]. Despite control measures, the resurgence of this zoonosis is a public health problem [15]. In 2020, on World Rabies Day, 11,534 domestic dogs were vaccinated and 27,869 stray dogs eliminated, although 60 outbreaks with 69 cases were recorded, compared with 43 cases in 2019 [14].

In addition, low awareness of the risks and preventive measures (wound cleansing, vaccination, animal surveillance) limits community involvement. [16, 17]. Vaccinating dogs prevents rabies, and human deaths can be avoided with appropriate care (washing, post-exposure vaccination, immunoglobulin) [4]. In low-income countries, rabies control is difficult due to low rates of dog vaccination, urbanization, deforestation, and lack of access to healthcare in rural areas [7]. Poverty and low awareness, generally associated with increased vulnerability to the disease, are therefore major obstacles to prevention and control, particularly in rural areas [8, 9]. Studies show that a good knowledge of rabies promotes better practices, as seen in Morocco and Kigali [18, 19].

As a member of the Pan-African Rabies Control Network, Senegal is aiming for "Zero human deaths due to dog-transmitted rabies by 2030" through an integrated plan involving several sectors, focusing on raising awareness, providing access to post-exposure care and strengthening surveillance. [14]. However, most of the studies in this area have been carried out among human and animal healthcare providers, but few have looked at the population level, including the study carried out in Sokone in 2017. This study showed that only 22.4% of community members surveyed had a good knowledge of rabies and how to deal with bites exposing them to rabies [20]. It is therefore useful to estimate people's knowledge, attitudes and practices regarding this disease in order to improve response measures. In view of the importance of these factors, and particularly as rural areas are more exposed to dogs, we decided to conduct this study as part of the setting up of the Niakhene human and animal health observatory in the Thies region, which was one of the 9 of the country's 14 regions to have had rabies outbreaks over the last five years [14].

2. Materials and Methods

2.1. Study Framework

The study was carried out in the rural commune of Niakhene, part of the Méckhe health district. The district is located in the department of Tivaouane in the Thies region of Senegal. The main economic activities are agriculture, livestock farming, handicrafts and petty trade. The district has 21 health posts, including 18 in rural areas, a referral health center in the commune of Méckhe and 72 health huts. There are no private or semi-public health facilities. The target population located less than 5 km from a health post is estimated at 60% of the total population. No private dispensaries were found in the commune.

2.2. Type and Population of the Study

This was a cross-sectional, descriptive and analytical sur-

vey conducted in October 2020. The study population consisted of people aged at least 18 at the time of the survey, living in the commune of Niakhene for more than six months. Not being able to answer to the questionnaire and the unwillingness participate were the non-inclusion criterias.

2.3. Sampling

The minimum sample size to be surveyed was calculated using the Schwartz formula with a desired precision (i) set at 5%, a reduced error (ε) of 1.96. The expected frequency of good knowledge, estimated in a study of rabies conducted in Sokone, Senegal, is: p = 22.4% [20] $n=((\varepsilon^2 \times p \times q))/i^2$ These parameters gave a necessary number of subjects of 267. For greater power, the size was increased to 300 individuals in the population, taking into account a refusal rate of 10%.

Sampling was carried out using a two-stage cluster survey stratified by sex and age. Thirty clusters of ten individuals each were distributed throughout the villages of the commune of Niakhene. At the first level, villages were selected systematically according to population weight. In each cluster selected, a stratification proportional to the population by age and sex was applied to guarantee representativeness. To identify the concessions to be surveyed, the interviewers used the itinerary method: they chose an intersection at random, then drew a direction with a pen to determine the route along the selected street. The interviewers included successive households until they had ten participants, divided by sex and age.

2.4. Data Collection

The study was conceptualized on the basis of the theory of knowledge, attitudes and practices studies. The CAP survey is a strategic planning and evaluation tool for identifying the educational needs of a specific target group [21, 22]. It assesses three points: the level of comprehensive knowledge, the attitudes motivating behavior, and the preventive and management practices of the target populations. The data were collected using a pre-coded electronic questionnaire based on a review of the literature, including two 2020 studies conducted in Burkina Faso [39] and Senegal [20] as well as WHO guidelines [23]. The final version of the questionnaire (Table A3) was recorded on an electronic terminal using Open Data Kit (ODK) Collect software, synchronized with an online server. The questionnaire was administered individually face-to-face by six interviewers, divided into two teams and supervised by two supervisors. Trained in Dakar, the interviewers were briefed on the methodology and ethics of the study. The data collected included three main components:

1. Identification and characteristics: information on the head of household and the person surveyed (name, age, sex, telephone), as well as marital status, level of education, occupation, ownership of property, housing status, source of water, and presence of animals (calculation of socio-economic quintile).

2. Knowledge of rabies: sources of information, signs of rabies, vectors, modes of transmission, post-bite preventive measures and evolution of the disease.

3. Attitudes and practices regarding rabies: dog ownership and vaccination, proximity of a veterinary center, experience of bites, and what to do in the event of a bite.

2.5. Operational Definition of Variables

The average rabies knowledge score was based on 17 items assessing knowledge of the signs, vector, mode of transmission, preventive measures and course of the disease, on a 5-point Likert scale. This score was used to divide respondents into two groups: those with a score equal to or above the average, considered to have good knowledge, and those with a lower score, considered to have poor knowledge of rabies.

Attitudes were determined on the basis of two dichotomous (yes/no) questions. The questions were: If you had a dog, would you have vaccinated it? And do you think that vaccinating animals, and dogs in particular, would help prevent rabies from bites?

Prevention practices in the event of a dog bite were measured by four items: washing the wound with soap, taking the anti-rabies vaccine, monitoring the animal, and sending the animal to a vet. A good prevention practice was defined if the respondent mentioned at least one of these four items.

2.6. Data Analysis

At the end of the survey, the data were extracted, compiled and cleaned before being analyzed using R 4.2.2 software. Quantitative variables were described in terms of mean and standard deviation, median and extremes, while qualitative variables were described in terms of absolute and relative frequencies. For the analytical study, variables were cross-tabulated. The Chi-square and Fisher tests were used with an alpha risk of 5%.

A multivariate binary logistic regression on knowledge, attitudes and practices was carried out, and all the variables expected to be crossed were introduced into the initial model. The models were compared using the likelihood ratio test with a top-down procedure [24]. The relevance of the model was studied using the Hosmer Lemeshow [25].

2.7. Ethics

The approval of the Research Ethics Committee (REC) of the Cheikh Anta Diop University of Dakar was obtained prior to the start of the activities, bearing the reference number O25/2020/CER/UCAD, as well as the authorization of the district health authorities. To this end, participation in this study was free. Signed consent was obtained from all participants aged 18 and over. The data collected remain confidential. The identity of individuals who consented to participate was not mentioned on the data collection tools. In all uses

made of the results, anonymity was respected, and no information enabling a participant to be identified was included in the database.

3. Results

3.1. Descriptive Results

3.1.1. Description of the Sample

The survey of 300 individuals revealed a predominantly young population, with an average age of 35.3 (±16.7), a median of 30 and extremes between 18 and 83. The most represented age group was 25-39 (37.7%). The majority of respondents were married (65.7%) and uneducated (67.7%). Socio-economically, the population was divided between the poorest (15.3%), the poor (15.3%), the middle (25%), the rich (23%) and the richest (21.4%) (Table 2).

3.1.2. Description of Knowledge

The study showed that 40% of respondents associated rabies with behavioral problems and 36% with a bite, but 30.7% did not know. Dogs were the main vectors (79.7%) and transmission was mainly attributed to bites (80.3%). In terms of prevention, 80% would go to a health facility, but 7.7% were unaware of the measures in place. Finally, 67% of participants had a good general knowledge of rabies (Table 1).

Friends and family are the main source of information (69.3%), followed by school (7.7%), while only 3.7% receive information from medical staff and less than 1% from animal health workers (Table 2).

Table 1. *Distribution of rabies knowledge assessment items.*

Knowledge	Absolute frequency (n)	Relative frequency (%)
Suspicion of rabies		
Behavioral problems: the person behaves like a dog	120	*40.0*
Person bitten by a dog/animal	108	*36.0*
Other answers	14	*4.7*
Don't know	92	*30.7*
Rabies vectors		
Dog	239	*79.7*
Cat	11	*3.7*
Monkey	8	*2.7*
Rodents	8	*2.7*
Ruminants	5	*1.7*
Equidae	5	*1.7*
Reptile	9	*3.0*
Other answers	6	*2.0*
Don't know	58	*19.3*
Transmission mode		
Bite	241	*80.3*
Scratch	8	*2.7*
Licking	5	*1.7*
Other answers	3	*1.0*
Don't know	58	*19.3*
Knowledge of prevention measures		
Wash the wound with plenty of water and soap	2	*0.7*
I will go to a health facility (rabies vaccination)	240	*80.0*

Knowledge	Absolute frequency (n)	Relative frequency (%)
Monitoring the animal	2	*0.7*
Send the animal to a vet	8	*2.7*
Other answers	1	*0.3*
Don't know	23	*7.7*
Knowledge of the evolution of rabies declared		
Deaths	111	*37.0*
Healing	97	*32.3*
Other answers	5	*1.7*
Don't know	87	*29.0*
Knowledge of the evolution of rabies declared		
Yes	201	67.0
No	99	*33,0*
Good general knowledge	201	67,0

Table 2. *Description of the sample and factors associated with knowledge of rabies.*

Variable	Description		Bivariate knowledge		p value	Multivariate		p value
	Workforce (n)	Frequency (%)	Yes (%) N=201	No (%) N=99		ORaj	95% CI	
Gender								
Male	157	*52.3*	101 (70.6%)	42 (29.4%)	*0.249*	-	-	-
Female	143	*47.7*	100 (63.7%)	57 (36.3%)		-	-	-
Age range								
[18-25 years]	98	*32.7*	47 (48.0%)	51 (52.0%)		Ref	Ref	Ref
[25-40 years]	113	*37.7*	84 (74.3%)	29 (25.7%)		4.61	2.18 - 10.1	*<0.001*
[40-59 years old]	48	*16*	41 (85.4%)	7 (14.6%)	*<0.001*	8.87	2.93 - 30.4	*<0.001*
60 and over	41	*13.6*	29 (70.7%)	12 (29.3%)		3.65	1.31 - 10.8	*0.016*
Married								
No	103	*34.3*	59 (57.3%)	44 (42.7%)	*0.014*	-	-	-
Yes	197	*65.7*	142 (72.1%)	55 (27.9%)		-	-	-
Level of education								
Without instruction	203	*67.7*	134 (66.0%)	69 (34.0%)		Ref	Ref	Ref
Primary	51	*17.0*	32 (62.7%)	19 (37.3%)	*0.329*	1.32	0.56 - 3.21	*0.5*
Secondary/Higher	46	*15.3*	35 (76.1%)	11 (23.9%)		6.28	2.20 - 19.5	*<0.001*

Variable	Description		Bivariate knowledge		p value	Multivariate		p value
	Workforce (n)	Frequency (%)	Yes (%) N=201	No (%) N=99		ORaj	95% CI	
Quintile								
Poorer	46	*15.3*	31 (67.4%)	15 (32.6%)		-	-	
Poor	46	*15.3*	33 (71.7%)	13 (28.3%)		-	-	
Medium	75	*25.0*	49 (65.3%)	26 (34.7%)	*0.528*	-	-	
Rich	69	*23.0*	50 (72.5%)	19 (27.5%)		-	-	
Richer	64	*21.4*	38 (59.4%)	26 (40.6%)		-	-	
Raising awareness in the media (newspapers. radio. TV)								
No	282	*94.4*	186 (66.0%)	96 (34.0%)		Ref	Ref	Ref
Yes	18	*6.0*	15 (83.3%)	3 (16.7%)	*0.207*	3.15	0.69 - 18.4	*0.200*
Raising awareness through friends and family								
No	92	*30.7*	175 (84.1%)	33 (15.9%)		Ref	Ref	Ref
Yes	208	*69.3*	175 (84.1%)	33 (15.9%)	*<0.001*	18.4	9.42 - 38.0	*<0.001*
Awareness-raising by human health agents								
No	289	*96.3*	190 (65.7%)	99 (34.3%)	*0.018*	Ref	Ref	Ref
Yes	11	*3.7*	11 (100%)	0 (0.00%)				
Awareness-raising by animal health officers								
No	298	*99.3*	199 (66.8%)	99 (33.2%)	*0.999*	Ref	Ref	Ref
Yes	2	*0.7*	2 (100%)	0 (0.00%)		-	-	-
Raising awareness via social networks								
No	299	*99.7*	200 (66.9%)	99 (33.1%)	*0.999*	Ref	Ref	Ref
Yes	1	*0.3*	1 (100%)	0 (0.00%)				
Raising awareness through schools and education centers								
No	277	*92.3*	184 (66.4%)	93 (33.6%)	0.615	Ref	Ref	Ref
Yes	23	*7.7*	17 (73.9%)	6 (26.1%)		-	-	-

3.1.3. Description of Attitudes and Practices to Prevent Rabies

Only 7.3% of participants owned a dog, but none of these dogs had been vaccinated against rabies. However, the majority (72.6%) said they would have vaccinated their dog if they had had the chance. A large proportion of participants (83.7%) recognized that vaccinating animals, particularly dogs, helps to prevent rabies in bites. Some 13.7% of respondents had been bitten by an animal (41 bites), with horses (36.7%) and scorpions (26.8%) being the main animals involved, followed by dogs (14.6%). In response to these bites, 39% of the people concerned said they had gone to a health facility, while 29.3% preferred to consult a traditional practitioner, and 31.7% took no action. When asked what they would do if bitten by a dog, 83.3% said they would go to a health facility for a rabies vaccination. However, 38.3% said they would also consult a traditional practitioner. Other reactions, such as cleaning the wound with soap and water (1%), monitoring the animal (1%), or sending it to a vet (1.7%), would be rare practices. Finally, 3% of participants admitted that they did not know how to react (Table 3).

3.2. Analytical Results

3.2.1. Depending on Knowledge

In bivariate analysis, several factors showed a significant

association with greater knowledge of rabies. The 40-59 age group (85.4%) and the 25-40 age group (74.3%) were significantly more knowledgeable than the 18-25 age group (48%, p<0.001). Married people (72.1%) knew more about rabies than unmarried people (57.3%, p = 0.014). In addition, participants with secondary education or higher (76.1%) were much better informed than those with no education (66%, p < 0.001). Informing friends and family was very effective, with 84.1% of participants who received information from this source showing good knowledge (p < 0.001) (Table 2).

In multivariate analysis, three key factors stood out. Age 40-59 significantly increased the chances of experiencing rabies (ORaj = 8.87; 95% CI: 2.93-30.4; p < 0.001). Secondary or higher education was also a determining factor (ORaj = 6.28; 95% CI: 2.20-19.5; p < 0.001). Lastly, awareness from friends and family had a predominant impact (ORaj = 18.4; 95% CI: 9.42-38.0; p < 0.001), far surpassing the other sources of awareness. In contrast, sex, marital status and socio-economic quintiles had no significant association after adjustment (Table 2).

Table 3. *Distribution of attitudes and practices regarding rabies.*

Attitudes and practices	Absolute frequency (n)	Relative frequency (%)
Dog ownership		
Yes	22	7.3
No	278	92.7
Vaccination of dogs against rabies (N=22)		
Yes	0	0.0
No	22	100.0
Have you vaccinated your dog against rabies?		
Yes	218	72.6
No	48	16.0
Don't know	34	11.4
Vaccinating animals. in particular dogs. helps prevent rabies from bites		
Yes	251	83.7
No	9	3.0
Don't know	40	13.3
Being bitten by an animal		
Yes	41	13.7
No	259	86.3
Type of animal (N=41)		
Dog	6	14.6
Cat	1	2.4
Donkey	3	7.3
Horse	15	36.7
Scorpio	11	26.8
Other	5	12.2
What was your reaction (N=41)		
I went to one of the health facilities	16	39.0
I went to see a practitioner of traditional medicine	12	29.3
Leave it like that	13	31.7
What do you do if you are bitten by an animal (dog) other than a snake?		

Attitudes and practices	Absolute frequency (n)	Relative frequency (%)
Wash the wound with plenty of water and soap	3	1.0
I will go to a health facility (rabies vaccination)	250	83.3
Monitoring the animal	3	1.0
Send the animal to a vet	5	1.7
Killing the animal	4	1.3
See a practitioner of traditional medicine	115	38.3
Don't know	9	3.0

3.2.2. Depending on Attitudes and Practices

In bivariate analysis, sex, age, marital status and level of education did not significantly influence the intention to vaccinate a dog. However, participants with good knowledge of rabies were more likely *(p=0.002)* to declare that they would vaccinate their dog (78.6%) than those with poor knowledge (60.6%). Similarly, awareness among friends and family played a key role, influencing the belief that vaccination prevented rabies (p=0.*004*). In terms of preventive practice, participants who were better informed about rabies were more likely to adopt this approach (90%) compared with those with limited knowledge (71.7%, p<0.*001*). Belief in the efficacy of vaccination also increased the likelihood of screening (87.3% of believers versus 67.3% of non-believers, *p=0.001*). The various sources of awareness, such as the media or social networks, had no impact on attitudes and prevention practices, with the exception of friends and family, which had a positive influence on attitudes (Table 4).

Table 5 shows the results of multivariate analysis associating various factors with attitudes and practices regarding rabies. Individuals with a good knowledge of rabies were significantly more likely to declare that they would vaccinate their dog (ORaj = 2.48; 95% CI: 1.45-4.26; p < 0.001). However, awareness by human health workers had no significant association (ORaj = 0.46; 95% CI: 0.13-1.82; p = 0.200). Good knowledge of rabies significantly increased the likelihood of believing that animal vaccination prevents rabies (ORaj = 3.23; 95% CI: 1.56-6.84; p = 0.002). Socioeconomic quintiles and awareness through the media or friends were not significantly associated with this belief. Individuals with a good knowledge of rabies practiced prevention more frequently (ORaj = 4.41; 95% CI: 2.00-9.87; p < 0.001). In addition, those who believed in the efficacy of vaccination were also more likely to adopt preventive practices (ORaj = 2.63; 95% CI: 1.23-5.52; p = 0.011). School-based awareness, although associated with a positive trend, was not significant after adjustment (ORaj = 3.77; 95% CI: 0.72-69.7; p = 0.200).

Table 4. *Bivariate analysis of factors associated with attitudes and practices towards rabies.*

Variable	Have you vaccinated your dog against rabies?		*p value*	Vaccination could prevent rabies		*p value*	Prevention practice		*p value*
	Yes (%)	No (%)		Yes (%)	No (%)		Yes (%)	No (%)	
	N=218	N=82		N=251	N=49		N=	N=	
Gender									
Male	104 (72.7%)	39 (27.3%)	*0.999*	122 (85.3%)	21 (14.7%)	*0.562*	119 (83.2%)	24 (16.8%)	*0.845*
Female	114 (72.6%)	43 (27.4%)		129 (82.2%)	28 (17.8%)		133 (84.7%)	24 (15.3%)	
Age range									
[18-25 years[	66 (67.3%)	32 (32.7%)	*0.218*	81 (82.7%)	17 (17.3%)	*0.891*	79 (80.6%)	19 (19.4%)	*0.667*
[25-40 years[	87 (77.0%)	26 (23.0%)		96	17		98	15	

Variable	Have you vaccinated your dog against rabies?		*p value*	Vaccination could prevent rabies		*p value*	Prevention practice		*p value*
	Yes (%)	**No (%)**		**Yes (%)**	**No (%)**		**Yes (%)**	**No (%)**	
	N=218	**N=82**		**N=251**	**N=49**		**N=**	**N=**	
				(85.0%)	(15.0%)		(86.7%)	(13.3%)	
[40-59 years old[	38 (79.2%)	10 (20.8%)		41 (85.4%)	7 (14.6%)		41 (85.4%)	7 (14.6%)	
60 and over	27 (65.9%)	14 (34.1%)		33 (80.5%)	8 (19.5%)		34 (82.9%)	7 (17.1%)	
Married									
No	71 (68.9%)	32 (31.1%)	*0.361*	83 (80.6%)	20 (19.4%)	*0.379*	84 (81.6%)	19 (18.4%)	*0.503*
Yes	147 (74.6%)	50 (25.4%)		168 (85.3%)	29 (14.7%)		168 (85.3%)	29 (14.7%)	
Level of education									
Without instruction	142 (70.0%)	61 (30.0%)		165 (81.3%)	38 (18.7%)		164 (80.8%)	39 (19.2%)	
Primary	40 (78.4%)	11 (21.6%)	*0.312*	45 (88.2%)	6 (11.8%)	*0.269*	45 (88.2%)	6 (11.8%)	*0.070*
Secondary/Higher	36 (78.3%)	10 (21.7%)		41 (89.1%)	5 (10.9%)		43 (93.5%)	3 (6.52%)	
Quintile									
Poorer	33 (71.7%)	13 (28.3%)		39 (84.8%)	7 (15.2%)		36 (78.3%)	10 (21.7%)	
Poor	36 (78.3%)	10 (21.7%)		35 (76.1%)	11 (23.9%)		37 (80.4%)	9 (19.6%)	
Medium	57 (76.0%)	18 (24.0%)	*0.462*	68 (90.7%)	7 (9.33%)	*0.247*	67 (89.3%)	8 (10.7%)	*0.412*
Rich	51 (73.9%)	18 (26.1%)		58 (84.1%)	11 (15.9%)		60 (87.0%)	9 (13.0%)	
Richer	41 (64.1%)	23 (35.9%)		51 (79.7%)	13 (20.3%)		52 (81.2%)	12 (18.8%)	
Raising awareness in the media (newspa-pers. radio. TV)									
No	204 (72.3%)	78 (27.7%)	*0.788*	234 (83.0%)	48 (17.0%)	*0.325*	235 (83.3%)	47 (16.7%)	*0.325*
Yes	14 (77.8%)	4 (22.2%)		17 (94.4%)	1 (5.56%)		17 (94.4%)	1 (5.56%)	
Raising awareness among friends and family									
No	61 (66.3%)	31 (33.7%)	*0.133*	68 (73.9%)	24 (26.1%)	*0.004*	75 (81.5%)	17 (18.5%)	*0.543*
Yes	157 (75.5%)	51 (24.5%)		183 (88.0%)	25 (12.0%)		177 (85.1%)	31 (14.9%)	

Variable	Have you vaccinated your dog against rabies?		*p value*	Vaccination could prevent rabies		*p value*	Prevention practice		*p value*
	Yes (%)	**No (%)**		**Yes (%)**	**No (%)**		**Yes (%)**	**No (%)**	
	N=218	**N=82**		**N=251**	**N=49**		**N=**	**N=**	
Awareness-raising by human health agents									
No	211 (73.0%)	78 (27.0%)	*0.500*	241 (83.4%)	48 (16.6%)	*0.999*	242 (83.7%)	47 (16.3%)	*1.000*
Yes	7 (63.6%)	4 (36.4%)		10 (90.9%)	1 (9.09%)		10 (90.9%)	1 (9.09%)	
Awareness-raising by animal health officers									
No	216 (72.5%)	82 (27.5%)	*0.999*	249 (83.6%)	49 (16.4%)	*0.999*	250 (83.9%)	48 (16.1%)	*1.000*
Yes	2 (100%)	0 (0.00%)		2 (100%)	0 (0.00%)		2 (100%)	0 (0.00%)	
Raising awareness via social networks									
No	217 (72.6%)	82 (27.4%)	*0.999*	250 (83.6%)	49 (16.4%)	*0.999*	251 (83.9%)	48 (16.1%)	*1.000*
Yes	1 (100%)	0 (0.00%)		1 (100%)	0 (0.00%)		1 (100%)	0 (0.00%)	
Raising awareness through schools and education centers									
No	201 (72.6%)	76 (27.4%)	*0.999*	231 (83.4%)	46 (16.6%)	*0.999*	230 (83.0%)	47 (17.0%)	*0.144*
Yes	17 (73.9%)	6 (26.1%)		20 (87.0%)	3 (13.0%)		22 (95.7%)	1 (4.35%)	
Knowledge about rabies									
Good	158 (78.6%)	43 (21.4%)	*0.002*	181 (90.0%)	20 (9.95%)	*<0.001*	181 (90.0%)	20 (9.95%)	*<0.001*
Wrong	60 (60.6%)	39 (39.4%)		70 (70.7%)	29 (29.3%)		71 (71.7%)	28 (28.3%)	
If you had a dog. would you have vaccinated it?									
Yes	-	-	-	-	-	-	191 (87.6%)	27 (12.4%)	*0.009*
No / Don't know	-	-	-	-	-	-	61 (74.4%)	21 (25.6%)	
Vaccination of animals could prevent rabies									
Yes	-	-	-	-	-	-	219 (87.3%)	32 (12.7%)	*0.001*
No / Don't know	-	-	-	-	-	-	33 (67.3%)	16 (32.7%)	

Table 5. *Final multivariate models of factors associated with attitudes and practices.*

Variable	Have you vaccinated your dog against rabies?		p value	Vaccination could prevent rabies		p value	Prevention practice		P value
	ORaj	95% CI		ORaj	95% CI		ORaj	95% CI	
Quintile									
Poorer	-	-	-	Ref	Ref	Ref	-	-	-
Poor	-	-	-	0.29	0.08- 1.04	*0.063*	-	-	-
Medium	-	-	-	1.67	0.45- 6.23	*0.400*	-	-	-
Rich	-	-	-	0.70	0.20- 2.37	*0.600*	-	-	-
Richer	-	-	-	0.68	0.20- 2.22	*0.500*	-	-	-
Raising awareness in the media (newspapers. radio. TV)									
No				Ref	Ref	Ref	Ref	Ref	Ref
Yes				3.08	0.48- 61.9	*0.300*			
Raising awareness among friends and family									
No	-	-	-	-	-	-	Ref	Ref	Ref
Yes	-	-	-	-	-	-	0.48	0.20- 1.09	*0.087*
Awareness-raising by human health agents									
No	Ref	Ref	Ref	-	-	-	-	-	-
Yes	0.46	0.13- 1.82	0.200	-	-	-	-	-	-
Raising awareness through schools and education centres									
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	-	-	-	-	-	-	3.77	0.72- 69.7	*0.200*
Knowledge about rabies									
Wrong	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Good	2.48	1.45- 4.26	<0.001	3.23	1.56- 6.84	*0.002*	4.41	2.00- 9.87	*<0.001*
Have you vaccinated your dog against rabies?									
Bad attitude				Ref	Ref	Ref			
A good attitude				12.4	5.96- 27.8	*<0.001*			
Vaccinating animals could prevent rabies									
Wrong	-	-	-	-	-	-	Ref	Ref	Ref
Good							2.63	1.23- 5.52	0.011

ORaj: Adjusted Odd Ratio; CI: Confidence Interval; *: Significance: Ref: Reference

4. Discussion

The main aim of this study, carried out in the commune of Niakhene in the Thiès region, was to identify the factors associated with knowledge, attitudes and practices in relation to rabies. This is the first survey of its kind in this locality, providing a solid basis for guiding health interventions and future research into rabies. It highlights crucial public health issues, particularly for Senegal, where rabies remains a neglected disease, despite being preventable. However, its cross-sectional and observational nature limited the establishment of causal relationships [26] The practices reported by the participants were also subject to social desirability bias, although this was minimized by training the interviewers and guaranteeing their anonymity [27].

Nearly 67.7% of participants had no education, a finding largely influenced by the rural context of the study. According to the High Council for Public Health (1998), a low level of education has a direct impact on people's attitudes and perceptions of public health issues [28].

This finding highlights the need for the Senegalese healthcare system to invest more in health education, particularly in rural areas. Unlike other studies, such as that by Adjé et al (2015), which identified the media as the main source of information, this survey found that family and friends played a predominant role in the transmission of information. [29]. This highlights the importance of using targeted community approaches, including tools such as local awareness campaigns, town criers and posters, to improve the dissemination of knowledge about rabies in rural communities [30].

The study showed that 80.3% of participants knew that biting is the main mode of transmission of rabies, a result similar to those observed in other contexts, such as Pakistan, Morocco and India [18, 31, 32]. However, the lack of awareness of other vectors, such as cats or rodents, illustrated a partial understanding of the disease, in line with observations made in Guatemala and Sri Lanka [33, 34]. Furthermore, only 37% of respondents were aware that untreated rabies inevitably leads to death, a much lower rate than that observed in studies in Morocco (89.2%) or Indonesia (93%) [17, 35]. These gaps in knowledge increase the risk of inappropriate behavior in the face of rabies, and highlight the need to step up health education. For the Senegalese healthcare system, this means incorporating these elements into education programs to raise awareness of the seriousness of the disease and close the knowledge gap.

Of the respondents, 7.3% owned a dog, but none of them had vaccinated their pet. This result contrasts with the 25.9% of dogs vaccinated in Pakistan [31] reflects a poor vaccination culture and the absence of mass vaccination campaigns in Senegal. This situation reveals an urgent need for the veterinary and human public health system to prioritize rabies in its zoonosis control strategies. Furthermore, only 1% of respondents knew that a bite should be washed out with soap and water, a critical gap that reflects a lack of basic prevention messages. Better integration of these messages into awareness programs is essential to reduce the risk of infection. [36].

Of the 13.7% of participants who had been bitten, 61% had not consulted a health facility, often preferring traditional remedies. This tendency, common among the poorest people, reflects a persistent mistrust of the healthcare system [37].

As observed in other countries, such as Bangladesh and India, these practices delay access to care and increase the risk of death [36, 38]. This situation highlights the need for the Senegalese healthcare system to raise awareness of the dangers of traditional remedies and improve access to healthcare in rural areas. The lack of access to healthcare facilities contributes directly to the continuing high number of rabies-related deaths. This situation could be alleviated by initiatives aimed at strengthening community confidence in the healthcare system [39]. For example, community health workers could play a key role in making people aware of the dangers of rabies and facilitating their referral to care facilities.

In multivariate analysis, older age, secondary or higher education (ORaj = 6.28; 95% CI: 2.20-19.5) and awareness among family and friends (ORaj = 18.4; 95% CI: 9.42-38.0) were significantly associated with better knowledge of rabies. These results corroborate those observed in Morocco, Nigeria and Ethiopia, and confirm that education and community awareness are essential levers in Senegal [18, 40, 41].

In addition, participants with good knowledge were more likely to adopt positive attitudes, such as vaccinating their dog (ORaj = 2.48; 95% CI: 1.45-4.26) or believing in the effectiveness of vaccination to prevent rabies (ORaj = 3.23; 95% CI: 1.56-6.84) and better prevention practices (ORaj = 4.41; 95% CI: 2.00-9.87). These observations underline the interdependence between knowledge, attitudes and practices, and the importance of overall community capacity building and the need for the Senegalese health system to strengthen collaboration between the human and animal health sectors in an integrated "One Health" approach. This approach allows to take not only the human being in his environment into consideration but also to prevent him from catching animal communicable diseases such as rabies; thus, it requires, for its realization a multi-sectorial and trans-disciplinary collaboration [42].

5. Conclusions

This study, carried out in the commune of Niakhene in the Thiès region, highlighted the gaps and strengths in people's knowledge, attitudes and practices in relation to rabies. It revealed a moderate level of knowledge, marked by a partial understanding of the modes of transmission and a lack of awareness of preventive measures, in particular washing wounds with soap and water. Preventive attitudes and practices, such as vaccinating dogs and seeking medical attention after a bite, remain inadequate. These behaviors, exacerbated by factors such as low levels of education, economic con-

straints and the influence of traditional practices, pose a major challenge for Senegal's healthcare system.

To effectively reduce the burden of rabies, this study highlights the need to adopt an integrated "One Health" approach combining human health, animal health, the environment, local authorities, mobilization and community involvement. This means stepping up awareness campaigns, stepping up dog vaccination, promoting simple preventive measures, and improving access to anti-rabies care for the most vulnerable sections of the population. With interdisciplinary, multisectoral coordination and adequate resources, Senegal can make significant progress in the fight against this neglected zoonosis and protect rural communities from its devastating impact.

Abbreviations

NCD	Non-communicable Disease
REC/CER	Research Ethics Committee
WHO	World Health Organization

Acknowledgments

We would like to thank the Directorate of Incubation, Extension and Community Support (DIVAC) of UCAD for supporting this project on the baseline study for the surveillance of zoonotic and non-transmissible communicable diseases as part of the UCAD health observatory. We would also like to thank the medical authorities, through Dr Ndèye Amy Ba, head doctor of the Meckhe health district, and her staff, in particular the head nurses at Niakhene. They facilitated contacts with the population and took samples in accordance with standards and measured weight and height.

Author Contributions

Amadou Ibra Diallo: Conceptualization, Funding acquisition, Methodology, Formal Analysis, Project administration, Validation, Data curation, Writing original draft

Khardiatou Barro: Methodology, Formal Analysis, Data curation, Writing original draft

Fatoumata Binetou Diongue: Methodology, Validation, Writing – review & editing

Mouhamadou Faly Ba: Methodology, Formal Analysis

Adama Sow: Supervision, Writing – review & editing

Mamadou Moustapha Ndiaye: Supervision, Writing – review & editing

Funding

The study received funding for young researchers from AFROHUM in 2020 for the fight against zoonotic diseases in Senegal. The funding was supplemented by support from Cheikh Anta Diop University, which made its Niakhene health observatory available for the study.

Data Availability Statement

Data are available upon request from the corresponding author.

Conflicts of Interest

The authors declare no conflicts of interest.

Appendix

Table A1. *Breakdown of awareness of rabies by gender and age group.*

Knowledge	Gender			Age range			
	Female N=157	**Male N=143**	**p value**	**18-24 years old N=98**	**Aged 25-59 N=161**	**60 and over N=41**	**p value**
Suspicion of rabies							
Behavioral problems: the person behaves like a dog	57 (36%)	63 (44%)	*0.211*	27 (28%)	70 (43%)	23 (56%)	*0.003*
Person bitten by a dog/animal	59 (38%)	49 (34%)	*0.633*	29 (30%)	69 (43%)	10 (24%)	*0.024*
Don't know	54 (34%)	38 (27%)	*0.180*	45 (46%)	37 (23%)	10 (24%)	*<0.001*
Rabies vectors							
Dog	120 (76%)	119 (83%)	*0.189*	70 (71%)	134 (83%)	35 (85%)	*0.045*

Knowledge	Gender			Age range			
	Female N=157	**Male N=143**	**p value**	**18-24 years old N=98**	**Aged 25-59 N=161**	**60 and over N=41**	**p value**
Cat	5 (3.2%)	6 (4.2%)	*0.875*	0 (0%)	10 (6.2%)	1 (2.4%)	*0.022*
Monkey	2 (1.3%)	6 (4.2%)	*0.157*	1 (1.0%)	4 (2.5%)	3 (7.3%)	*0.112*
Rodents	4 (2.5%)	4 (2.8%)	*0.999*	0 (0%)	6 (3.7%)	2 (4.9%)	*0.066*
Ruminants	2 (1.3%)	3 (2.1%)	*0.672*	0 (0%)	3 (1.9%)	2 (4.9%)	*0.066*
Equidae	2 (1.3%)	3 (2.1%)	*0.672*	1 (1.0%)	3 (1.9%)	1 (2.4%)	*0.834*
Reptile	5 (3.2%)	4 (2.8%)	*0.999*	4 (4.1%)	4 (2.5%)	1 (2.4%)	*0.801*
Don't know	36 (23%)	22 (15%)	*0.132*	26 (27%)	26 (16%)	6 (15%)	*0.087*
Transmission mode							
Bite	120 (76%)	121 (85%)	*0.102*	72 (73%)	135 (84%)	34 (83%)	*0.113*
Scratch	5 (3.2%)	3 (2.1%)	*0.725*	1 (1.0%)	6 (3.7%)	1 (2.4%)	*0.412*
Licking	2 (1.3%)	3 (2.1%)	*0.672*	1 (1.0%)	4 (2.5%)	0 (0%)	*0.694*
Don't know	36 (23%)	22 (15%)	*0.132*	26 (27%)	26 (16%)	6 (15%)	*0.087*
Knowledge of prevention measures							
Wash the wound with plenty of water and soap	1 (0.6%)	1 (0.7%)	*0.999*	0 (0%)	0 (0%)	2 (4.9%)	*0.018*
I'll go to a health facility	122 (78%)	118 (83%)	*0.370*	77 (79%)	135 (84%)	28 (68%)	*0.077*
Monitoring the animal	2 (1.3%)	0 (0%)	*0.499*	1 (1.0%)	1 (0.6%)	0 (0%)	*0.999*
Send the animal to a vet	3 (1.9%)	5 (3.5%)	*0.485*	2 (2.0%)	5 (3.1%)	1 (2.4%)	*0.886*
Don't know	15 (9.6%)	8 (5.6%)	*0.285*	11 (11%)	8 (5.0%)	4 (9.8%)	*0.255*
Knowledge of evolution							
Deaths	56 (36%)	55 (38%)	*0.703*	23 (23%)	71 (44%)	17 (41%)	*0.003*
Don't know	50 (32%)	37 (26%)	*0.312*	35 (36%)	38 (24%)	14 (34%)	*0.084*

Table A2. *Distribution of awareness of rabies by level of education and socio-economic status.*

Knowledge	Level of education				Socio-economic level			
	No instruction N=203	**Primary N=51**	**Secondary and higher N=46**	**P value**	**Poor N=92**	**Medium N=106**	**Rich N=102**	**P value**
Suspicion of rabies								
Behavioural problems: the person behaves like a dog	78 (38%)	18 (35%)	24 (52%)	*0,172*	33 (36%)	37 (35%)	50 (49%)	*0,072*
Person bitten by a dog/animal	71 (35%)	20 (39%)	17 (37%)	*0,844*	35 (38%)	47 (44%)	26 (25%)	*0,016*
Don't know	63 (31%)	19 (37%)	10 (22%)	*0,249*	27 (29%)	33 (31%)	32 (31%)	*0,947*
Rabies vectors								
Dog	158 (78%)	39 (76%)	42 (91%)	*0,101*	73 (79%)	85 (80%)	81 (79%)	*0,986*
Cat	6 (3,0%)	2 (3,9%)	3 (6,5%)	*0,463*	6 (6,5%)	3 (2,8%)	2 (2,0%)	*0,268*

Knowledge	Level of education				Socio-economic level			
	No instruction N=203	**Primary N=51**	**Secondary and higher N=46**	**P value**	**Poor N=92**	**Medium N=106**	**Rich N=102**	**P value**
Monkey	3 (1,5%)	2 (3,9%)	3 (6,5%)	*0,074*	2 (2,2%)	2 (1,9%)	4 (3,9%)	*0,669*
Rodents	5 (2,5%)	0 (0%)	3 (6,5%)	*0,122*	4 (4,3%)	0 (0%)	4 (3,9%)	*0,064*
Ruminants	4 (2,0%)	0 (0%)	1 (2,2%)	*0,657*	4 (4,3%)	0 (0%)	1 (1,0%)	*0,026*
Equidae	3 (1,5%)	1 (2,0%)	1 (2,2%)	*0,821*	1 (1,1%)	1 (0,9%)	3 (2,9%)	*0,535*
Reptile	7 (3,4%)	2 (3,9%)	0 (0%)	*0,592*	2 (2,2%)	1 (0,9%)	6 (5,9%)	*0,115*
Don't know	43 (21%)	12 (24%)	3 (6,5%)	*0,053*	19 (21%)	21 (20%)	18 (18%)	*0,859*
Transmission mode								
Bite	159 (78%)	39 (76%)	43 (93%)	*0,049*	72 (78%)	85 (80%)	84 (82%)	*0,773*
Scratch	4 (2,0%)	1 (2,0%)	3 (6,5%)	*0,158*	2 (2,2%)	3 (2,8%)	3 (2,9%)	*0,999*
Licking	5 (2,5%)	0 (0%)	0 (0%)	*0,495*	2 (2,2%)	1 (0,9%)	2 (2,0%)	*0,744*
Don't know	43 (21%)	12 (24%)	3 (6,5%)	*0,053*	19 (21%)	21 (20%)	18 (18%)	*0,859*
Knowledge of prevention measures								
Wash the wound with plenty of water and soap	1 (0,5%)	1 (2,0%)	0 (0%)	*0,543*	0 (0%)	1 (0,9%)	1 (1,0%)	*0,999*
I'll go to a health facility	156 (77%)	41 (80%)	43 (93%)	*0,039*	73 (79%)	87 (82%)	80 (78%)	*0,792*
Monitoring the animal	1 (0,5%)	0 (0%)	1 (2,2%)	*0,312*	0 (0%)	1 (0,9%)	1 (1,0%)	*0,999*
Send the animal to a vet	3 (1,5%)	2 (3,9%)	3 (6,5%)	*0,074*	3 (3,3%)	3 (2,8%)	2 (2,0%)	*0,906*
Don't know	17 (8,4%)	5 (9,8%)	1 (2,2%)	*0,307*	6 (6,5%)	8 (7,5%)	9 (8,8%)	*0,833*
Knowledge of evolution								
Deaths	74 (36%)	14 (27%)	23 (50%)	*0,069*	34 (37%)	40 (38%)	37 (36%)	*0,976*
Don't know	61 (30%)	20 (39%)	6 (13%)	*0,015*	28 (30%)	33 (31%)	26 (25%)	*0,626*

Table A3. *Breakdown of attitudes and practices towards rabies by gender and age group status.*

Attitudes and practices	Gender			Age range			
	Female N=157	**Male N=143**	**p value**	**18-24 years old N=98**	**Aged 25-59 N=161**	**60 and over N=41**	**p value**
Vaccinating animals. especially dogs. helps prevent rabies from bites.							
Yes	129 (81.9%)	122 (84.2%)		81 (83%)	137 (85%)	33 (80%)	
No	5 (3.2%)	4 (2.8%)	*0.779*	5 (5.1%)	4 (2.5%)	0 (0%)	*0.428*
Don't know	23 (14.9%)	17 (12%)		12 (12%)	20 (12%)	8 (20%)	
What do you do if you are bitten by an animal (dog) other than a snake?							
Wash the wound with plenty of water and soap	1 (0.6%)	2 (1.4%)	*0.607*	0 (0%)	1 (0.6%)	2 (4.9%)	*0.050*

Attitudes and practices	Gender			Age range			
	Female N=157	**Male N=143**	**p value**	**18-24 years old N=98**	**Aged 25-59 N=161**	**60 and over N=41**	**p value**
I will go to a health facility (rabies vaccination)	132 (84%)	118 (83%)	*0.836*	79 (81%)	138 (86%)	33 (80%)	*0.492*
Monitoring the animal	2 (1.3%)	1 (0.7%)	*0.999*	2 (2.0%)	1 (0.6%)	0 (0%)	*0.717*
Send the animal to a vet	1 (0.6%)	4 (2.8%)	*0.196*	1 (1.0%)	3 (1.9%)	1 (2.4%)	*0.834*
Killing the animal	1 (0.6%)	3 (2.1%)	*0.351*	1 (1.0%)	1 (0.6%)	2 (4.9%)	*0.121*
See a practitioner of traditional medicine	57 (36%)	58 (41%)	*0.523*	35 (36%)	63 (39%)	17 (41%)	*0.780*
Don't know	6 (3.8%)	3 (2.1%)	*0.506*	4 (4.1%)	4 (2.5%)	1 (2.4%)	*0.233*

Table A4. *Breakdown of attitudes and practices against rabies by level of education and Socio-economic.*

	No instruction N=203	**Primary N=51**	**Secondary and higher N=46**	**P value**	**Poor N=92**	**Medium N=106**	**Rich N=102**	**P value**
Vaccinating animals, in particular dogs, helps prevent rabies from bites								
Yes	165 (81%)	45 (88%)	41 (89%)		74 (80%)	94 (89%)	83 (81%)	
No	Attitudes and practices	Level of education	Socio-economic level	*0,011*	1 (1,1%)	1 (0,9%)	7 (6,9%)	*0,044*
Don't know	33 (16%)	6 (12%)	1 (2,2%)		17 (18%)	11 (10%)	12 (12%)	
What do you do if you are bitten by an animal (dog) other than a snake?								
Wash the wound with plenty of water and soap	1 (0,5%)	1 (2,0%)	1 (2,2%)	*0,245*	0 (0%)	1 (0,9%)	2 (2,0%)	*0,649*
I will go to a health facility (rabies vaccination)	164 (81%)	43 (84%)	43 (93%)	*0,111*	73 (79%)	93 (88%)	84 (82%)	*0,272*
Monitoring the animal	0 (0%)	1 (2,0%)	2 (4,3%)	*0,020*	1 (1,1%)	2 (1,9%)	0 (0%)	*0,527*
Send the animal to a vet	3 (1,5%)	0 (0%)	2 (4,3%)	*0,266*	2 (2,2%)	1 (0,9%)	2 (2,0%)	*0,744*
Killing the animal	2 (1,0%)	1 (2,0%)	1 (2,2%)	*0,390*	1 (1,1%)	1 (0,9%)	2 (2,0%)	*0,842*
See a practitioner of traditional medicine	80 (39%)	20 (39%)	15 (33%)	*0,686*	45 (49%)	33 (31%)	37 (36%)	*0,032*
Don't know	9 (4,4%)	0 (0%)	0 (0%)	*0,147*	2 (2,2%)	4 (3,8%)	3 (2,9%)	*0,913*

References

[1] Tiembré I, Aka-Kone DMB, Konan YE, Béni é Bi Vroh J, Ekra KD, Dagnan NS, et al. Compliance with rabies vaccination in subjects exposed to rabies in Abidjan (Côte d'Ivoire). Santé Publique. 2009; 21(6): 595.

[2] Audry P. Rage. Diploma in tropical medicine of the Indian Ocean. 2012.

[3] Knobel DL, Cleaveland S, Coleman PG et al (Re-evaluating the burden of rabies in Africa and Asia. Bull World Health Organ 2005 83, 360-368.

[4] World Health Organization, Expert Consultation on Rabies, third report. Geneva, 2018 (WHO Technical Report Series, No. 1012). Licence: CC BY-NC-SA 3.0 IGO.

[5] Bourhy H., Dautry-Varsat A., Hotez P. Z. And Salomon J., Rabies, still neglected after 125 years of vaccination. PLoS Negl Trop Dis. 4(11): 839.

[6] World Health Organization, Expert Consultation on Rabies. First report. Geneva, 2004 (WHO Technical Report Series, No. 931). 2.

[7] Abela-Ridder. B., Knopf. L., Martin. S., Taylor. L., Torres. G. And De Balogh. K, 2016. 2016: the beginning of the end of rabies? The Lancet Global Health, Vol. 4, n °11, pp. e780-e781. https://doi.org/10.1016/S2214-109X(16)30245-5

[8] Dodet B, Adjogoua EV, Aguemon AR, Amadou OH, Atipo AL, Baba BA, et al. Fighting rabies in Africa: The Africa Rabies Expert Bureau (AfroREB). Vaccine. Nov 2008; 26(50): 6295 8.

[9] Philippe G, Florence RD, Philippe P, Philippe B, and Hervé B.. Risk for Rabies Importation From North Africa, December 2011; Vol. 17, No. 12.

[10] Guide de lutte contre la rage chez l'homme, Direction de l'épidémiologie et de lutte contre les maladies, Ministère de la santé, Morocco, 2003.

[11] World Health Organization. WHO Expert Consultation on Rabies. 931, 1-121. Geneva 2005, WHO. WHO Technical Report Series.

[12] Kayali U, Mindekem R, Yemadji N et al. Incidence of canine rabies in N'Djamena, Chad. Prev. Vet. Med 2003. 61, 227-233.

[13] Tiembré I., Dagnan S., Douba A., Adjogoua E. V., Bourhy H., Dacheux L., Kouassi L., Dosso M. and Odehouri-Koudou P., 2010. - Epidemiologic monitoring of human rabies in an endemic canine rabies area in the Ivory Coast. Medicine and Infectious Diseases. 40: 398-403.

[14] 2020 rabies epidemiological situation in Senegal, p-6. https://rr-africa.woah.org/wp-content/uploads/2021/03/situation-epidemiologique-de-la-rage-au-senegal.pdf

[15] Migan A. G., 2007, Contribution à l'étude de l'épidémiologie de la rage au Sénégal au cours de la période de 1996 à2005. Th: Méd. Vét: Dakar; 1.

[16] Mascie-Taylor, C.; Karim, R.; Karim, E.; Akhtar, S.; Ahmed, T.; Montanari, R. The cost-effectiveness of health education to improve knowledge and awareness of intestinal parasites in rural Bangladesh. Econ. Hum. Biol. 2003, 1, 321-330.

[17] Espinoza-Gomez, F.; Moises, H.; Coll-Cardenas, R. Educational campaign against malathion spraying for the control of Aedes aegypti in Colima, Mexico. J. Epidemiol. Community Health 2002, 56, 148.

[18] Bouaddi, K.; Bitar, A.; Bouslikhane, M.; Ferssiwi, A.; Fitani, A.; Mshelbwala, P. P. Knowledge, Attitudes, and Practices Regarding Rabies in El Jadida Region, Morocco. Vet. Sci. 2020, 7, 29. https://doi.org/10.3390/vetsci7010029

[19] Ntampaka P, Nyaga PN, Niragire F, Gathumbi JK, Tukei M (2019) Knowledge, attitudes and practices regarding rabies and its control among dog owners in Kigali city, Rwanda. PLoS ONE 14(8): e0210044. https://doi.org/10.1371/journal.pone.0210044

[20] Niang, K., Tine, J., Ndao, A., Diongue, F., Diallo, A., Faye, A., Ndiaye, P. and Tal-Dia, A. (2020) Knowledge and Attitudes of Health Care Providers and the Population about Rabies in Sokone Health District, Senegal. Open Journal of Preventive Medicine, 10, 63-71. https://doi.org/10.4236/ojpm.2020.104004

[21] Essi M, J. Njoya O. The C. A. P. (Knowledge, Attitudes, Practices) survey in medical research. Health Sciences and Diseases. June 2013; 14: 2.

[22] Save The Children. Child Protection Knowledge, Attitudes and Practices Surveys. Child protection programme guide to designing and implementing step-by-step C. A. P. survey methods. December 2012: 124.

[23] World Health Organization. Rabies: Key facts. Geneva 21 April 2020. https://www.who.int/fr/news-room/fact-sheets/detail/rabies

[24] Sakamoto Y, Ishiguro M, M Kitagawa G. 1986. Akaike Information Criterion Statistics. D. Reidel Publishing Company.

[25] Hosmer DW, Lemeshow S. Apply logistic regression. New-York, Willey-Blackwell, 2013, 528p.

[26] Dumas O, Siroux V, Le Moual N, Varraso R. Approches d'analyse causale en épidémiologie. Journal of Epidemiology and Public Health. 1 Feb 2014; 62(1): 53-63.

[27] CHIPEAUX M. Les différents biais présents dans les enquêtes. Le Sphinx 27 rue Cassiopée 74650 Chavanod [Internet]. Le Sphinx. 2024 [cited 8 Dec 2024]. Available from: https://www.lesphinx-developpement.fr/blog/les-differents-biais-presents-dans-les-enquetes/

[28] Haut Conseil de la Santé Publique HCSP France, 1998. La progression de la précarité en France et ses effets sur la santé ENSP, Rennes, France, 368 p.

[29] Adjé K. J. F., N'Dour A. P. N., Coulibaly F., Halidou A. I., Mabeki R., Koné P., 2015. Knowledge, attitudes, and practices concerning rabies and post-exposure prophylactic measures at the Cheikh Anta Diop University in Dakar. Méd. Mal. Infect. 45 (7): 306-307, https://doi.org/10.1016/j.medmal.2015.05.002

[30] Mosimann L., Traoré A., Mauti S,, Léchenne M., Obrist B., Véron R., Hattendorf J., et al., 2017. A mixed methods approach to assess animal vaccination programmes: the case of rabies control in Bamako, Mali. Acta Trop, 165: 203-215, https://doi.org/10.1016/j.actatropica.2016.10.007

[31] Ahmed, T., Hussain, S., Zia, UuR. et al. Knowledge, attitude and practice (KAP) survey of canine rabies in Khyber Pakhtunkhwa and Punjab Province of Pakistan. BMC Public Health 20, 1293 (2020). https://doi.org/10.1186/s12889-020-09388-9

[32] Herbert, M.; RiyazBasha, S.; Thangaraj, S. Community perception of rabies prevention and stray dog control in urban slums in India. J. Infect. Public Health 2012, 5, 374-380.

[33] Moran, D.; Juliao, P.; Alvarez, D.; Lindblade, KA; Ellison, JA; Gilbert, AT; Petersen, B.; Rupprecht, C.; Recuenco, S. Knowledge, attitudes and practices regarding rabies and bat exposure in two rural communities in Guatemala. BMC Res. Notes 2015, 8, 955.

[34] Muthunuwan, JT; Ganhewa, AGKH; Perera, HDSG; Hisham, M.; Bandara, WMMS; Gunasekera, HAKM Preliminary survey of rabies knowledge, attitudes and practices. Sri Lankan J. Infect. Dis. 2017, 7, 38-46.

[35] Rehman S, Rantam FA, Rehman A, Effendi MH, Shehzad A. Knowledge, attitudes, and practices toward rabies in three provinces of Indonesia. Vet World. 2021 Sep; 14(9): 2518-2526. https://doi.org/10.14202/vetworld.2021.2518-2526

[36] Ghosh, S.; Chowdhury, S.; Haider, N.; Bhowmik, RK; Rana, MS; Prue Marma, AS; Hossain, MB; Debnath, North Carolina; Ahmed, B. Rabies awareness and response to dog bites in a Bangladeshi community. Veterinary. Med. Sci. 2016, 2, 161-169.

[37] Wallace, RM; Mehal, J.; Nakazawa, Y.; Recuenco, S.; Bakamutumaho, B.; Osinubi, M.; Tugumizemu, V.; Blanton, JD; Gilbert, A.; Wamala, J. The impact of poverty on dog owners and access to canine rabies vaccination: Results from a knowledge, attitudes and practices survey, Uganda 2013. Infect. Dis. Poverty 2017, 6, 97.

[38] Krishnamoorthy, Y.; Vijayageetha, M.; Sarkar, S. Rabies awareness in the general population and treatment-seeking behaviour following a dog bite in rural Pondicherry: a community-based cross-sectional study. Int. J. Community Med. Public Health 2018, 5, 2557-2563.

[39] Penjor K, Tenzin T, Jamtsho RK. Determinants of health care seeking behaviour of animal bite victims in endemic rabies in southern Bhutan: a community-based contact tracing survey. BMC Public Health. 2019; 19(1): 237.

[40] Digafé, RT; Kifelew, LG; Mechesso, AF Rabies knowledge, attitudes and practices: a questionnaire survey of rural household heads in Gondar Zuria district, Ethiopia. BMC Res. Remarks. 2015, 8, 400.

[41] Ameh V. O., Dzikwi A. A., Umoh J. U., 2014. Assessment of knowledge, attitude and practice of dog owners to canine rabies in Wukari Metropolis, Taraba State Nigeria. Glob. J. Health Sci. 6 (5): 226-240, https://doi.org/10.5539/gjhs.v6n5p226

[42] Djegui F, Gourlaouen M, Coetzer A, Adjin R, Tohozin R, Leopardi S, Mauti S, Akpo Y, Gnanvi C, Nel LH, De Benedictis P. Capacity Building Efforts for Rabies Diagnosis in Resource-Limited Countries in Sub-Saharan Africa: A Case Report of the Central Veterinary Laboratory in Benin (Parakou). Front Vet Sci. 2022 Jan 18; 8: 769114. https://doi.org/10.3389/fvets.2021.769114

Research Field

Amadou Ibra Diallo: Public health, Epidemiology, Health and the environment, Communicable diseases, Non-communicable diseases, The health system, Maternal and child health

Khardiatou Barro: Public health, Epidemiology, Communicable diseases, Non-communicable diseases, The health system

Fatoumata Binetou Diongue: Public health, Epidemiology, Biostatistics, Health information system, Non-communicable diseases, The health system

Mouhamadou Faly Ba: Public health, Epidemiology, Biostatistics, Health information system, Non-communicable diseases, The health system

Adama Sow: Public health, Epidemiology, Biostatistics, Maternal and child health, Non-communicable diseases, The health system

Mamadou Moustapha Ndiaye: Public health, Epidemiology, Biostatistics, Communicable diseases, Non-communicable disease