

## Epidemiological Investigation of A Goat Rabies Outbreak and Assessment of Knowledge, Attitudes, and Practices of Communities Regarding Rabies in the Rural Commune of Sabou, Burkina Faso

Madi Savadogo<sup>1,6,7</sup>, Guy Sidwatta Ilboudo<sup>2,6</sup>, Laibané Dieudonné Dahourou<sup>3,6</sup>, Hamidou Zangré<sup>4,6</sup>, Kalidou Zerbo<sup>5</sup>, Abdoul Kader Ilboudo<sup>1,2,6</sup>, Zékiba Tarnagda<sup>1</sup>

<sup>1</sup>Institut de Recherche en Sciences de la Santé, Ouagadougou, Burkina Faso

<sup>2</sup>International Livestock Research Institute, Ouagadougou, Burkina Faso

<sup>3</sup>Université de Dédougou, Dédougou, Burkina Faso

<sup>4</sup>Direction Générale des Services Vétérinaires, Ouagadougou, Burkina Faso

<sup>5</sup>Ecole Nationale de l'Elevage et de la Santé Animale, Ouagadougou, Burkina Faso

<sup>6</sup>Rabies Free Burkina Faso, Ouagadougou, Burkina Faso

<sup>7</sup>Faculté de Médecine Vétérinaire, Université de Liège, Belgique

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### ABSTRACT

**Background:** Dog-mediated human rabies is one of the top five priority zoonotic diseases identified for the One Health multisectoral engagement in Burkina Faso. Integrated approaches are required in endemic areas for reliable data collection and improved management of bite victims. This study aimed to assess the knowledge, attitudes, and practices of communities regarding rabies and preventive methods.

**Subjects and Method:** A cross-sectional household survey was conducted in the Commune of Sabou after a goat rabies confirmation. A structured questionnaire was administered to 305 household members to capture data. The dependent variables in this study were the knowledge of rabies and animal vectors, the action to be taken regarding the biting animal, the main challenges to PEP coverage, the knowledge of preventive measures, and the minimum age recommended for primo-vaccination. The independent variables in this study were gender, level of education, professional status, and dog-owning status. The study was analyzed using the Chi-Square test.

**Results:** The results provided that the suspected goat was infected by the rabies virus. Subsequently, the outbreak joint investigation initiated involved key local stakeholders. Data collected during the investigation raised the need for counter-measures such as identification of awareness gaps, organization of a dog rabies vaccination, and awareness-raising campaigns in the local communities. The household survey revealed low awareness about animals involved in human rabies transmission, the common routes of transmission, and the postexposure prophylaxis. Moreover, hindrances to postexposure prophylaxis access cited by the participants were related to frequent vaccine shortage (39.7%) as well as financial inaccessibility (60.3%). In addition, 40% of participants were not well aware of pet rabies prevention and reported only 67.6% of owned dogs were vaccinated.

**Conclusion:** According to the study results, there is a need to strengthen rabies surveillance, promoting outbreak joint investigation, and integrated bite case management. Moreover, key messages on animal and human rabies prevention should be developed and shared with the communities.

**Keywords:** Canine rabies, zoonoses, joint investigation, community awareness, public health, household survey

#### Correspondence:

Madi Savadogo. Institut de Recherche en Sciences de la Santé (IRSS), 03 BP 7047 Ouagadougou. Burkina Faso. Email: savadogo.madi@yahoo.fr. Phone: +22670242570.

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## BACKGROUND

Rabies is a fatal encephalomyelitis caused by a virus that affects domestic and wild mammals as well as humans. This infectious zoonotic disease is transmitted through bite, scratch or lick by a rabid animal. It is a very ancient disease and remains endemic in over 150 countries around the world (Tarantola, 2017; WHO, 2018). According to previous studies, about 98% of human rabies in Asia and Africa are caused by dogs, highlighting the relevance of mass dog vaccination and on-time postexposure prophylaxis for bite victims. Indeed, it is recognized that sustained vaccination coverage of over 70% of the dog population in an endemic area allows rabies elimination in dogs, saving lives and human vaccines (Zinsstag et al., 2009; Zinsstag et al., 2017; Thumbi et al., 2022). However, canine rabies still represents a global public health challenge. Despite more than 130 years of existence of vaccines against animal and human rabies, the burden of the disease related to public health remains considerable, with a global estimate of more than 59,000 human deaths every year (Lankester et al., 2014; Hampson et al., 2015).

For decades considered a neglected disease, rabies has been under-reported in Burkina Faso (Dodet et al., 2010; Savadogo et al., 2022), making it difficult to gather reliable data for improved related health policies and interventions. Nevertheless, based on laboratory investigations, over 70% of biting dogs were confirmed as rabies-positive (Savadogo et al., 2020; Minoungou et

al., 2021). In addition, about 25 human rabies are annually recorded, and about 11,500 bite victims are notified in the two post-exposure prophylaxis (PEP) centers located in the biggest cities of the country, i.e Ouagadougou and Bobo Dioulasso (Burkina Faso, 2022<sup>a</sup>).

Since 2017 canine rabies has been included among the five top-priority zoonotic diseases selected for multi-sectoral engagement in the framework of the implementation of the One Health approach in Burkina Faso (Centers for Disease Control, 2017). To date, the fight against dog-mediated human rabies in the country relies on several strategies, including public awareness, pet rabies vaccination, PEP for bite victims as well and rabies surveillance in humans and animals. This involves various stakeholders, including public entities (especially animal health and human health sectors), private stakeholders (e.g. private veterinary clinics), international public health institutions and NGOs as well as local civil society organizations (Savadogo et al., 2021a; Savadogo et al., 2022). Despite this national effort, the in-country Stepwise Approach towards Rabies Elimination (SARE) assessment conducted in March 2022 indicated a national score of 1.5, indicating that small-scale rabies control programs are in place (Global Alliance for Rabies Control, 2022). Based on the gaps and recommendations from the SARE assessment, the country developed in November 2022 the very first integrated national strategic plan for the elimination of

dog-mediated human rabies by 2030 (Tidman et al., 2023; Savadogo et al., 2023). In recent years, beyond the initiatives developed by the government authorities, there has been increasing activism from civil society organizations, especially in the field of education and awareness raising for rabies control. For example, Rabies Free Burkina Faso (<http://rabiesfreebf.org/>), as a multi-disciplinary civil society organization, is One Health-oriented platform set in September 2020 to contribute to rabies control through awareness raising, dog vaccination, postexposure prophylaxis, rabies research, and surveillance (Savadogo et al., 2023). The paper reports the results of a study conducted by members of Rabies Free Burkina Faso following notification of a case of rabies in a goat in rural Commune of Sabou. In what follows, we present key results from a piloted outbreak joint investigation conducted in the Rural Commune of Sabou, and from a rapid appraisal of the knowledge, attitudes, and practices of the local community members regarding rabies risk and prevention measures. This study

aimed to assess the knowledge, attitudes, and practices of communities regarding rabies and preventive methods.

## SUBJECTS AND METHOD

### 1. Study Design

The study was conducted from October 2021 to January 2022 in the rural Commune of Sabou, located about 80 km from Ouagadougou in the administrative region of Centre-Ouest (Figure 1). According to a previous study, pet vaccination and community awareness campaigns are often organized by the animal health authorities of the region (Savadogo et al., 2022). The study was initiated in the context of a goat rabies outbreak management (Savadogo et al., 2023), and was composed of the following steps. The first phase corresponded to a goat rabies outbreak investigation (i.e laboratory confirmation, field joint investigation). The second phase was a household survey conducted to assess the knowledge, attitudes, and practices regarding rabies and prevention measures in the community.



**Figure 1. The geographical location of the study area in Burkina Faso**

### 2. Population and Sample

The outbreak investigation consisted of laboratory confirmation of rabies in the

suspected goat, followed by a joint investigation among the key stakeholders. Thus, the suspected goat was put under veterinary

observation and died 3 days later. Subsequently, a brain sample was collected for laboratory investigation using the fluorescent antibody test (FAT) (Robardet et al., 2011; Savadogo et al., 2020) at the national livestock laboratory (Laboratoire National d'Elevage) located in Ouagadougou. In addition, a joint investigation was conducted by a team composed of two animal health epidemiologists and one human health epidemiologist. They were supported by the local head of veterinary services and the local head of the human health center. Individual and group discussions were conducted with the affected community members (n=03) and stakeholders from the entities involved in rabies control (regional livestock directorate in Koudougou (n=06), veterinary office of Sabou (n=01), medical center of Sabou (n=05, municipality of Sabou (n=01)). Based on a respondent-driven approach, each interviewed participant was asked to introduce the interviewer to another household regardless of their dog-owning status. According to the logistic convenience (Aiyedun and Olugasa, 2012), a total of 305 community members were interviewed. A Questionnaire was administered to household heads and other household members in the absence of the household's head.

### 3. Study Variables

The dependent variables in this study were the knowledge of rabies and animal vectors, the action to be taken regarding the biting animal, the main challenges to PEP coverage, the knowledge of preventive measures, and the minimum age recommended for primo-vaccination. The independent variables in this study were gender, level of education, professional status, and dog-owning status.

During the household survey, data were collected on the respondents' socio-demographics, their knowledge of rabies, their perceptions of the management of bite

cases, and their understanding of measures for pet rabies control.

### 4. Operational Definition of Variables

**The participant's socio-demographic variables:** included gender, level of study, employment status, and dog-owning status of the respondent household.

**The participants' knowledge of rabies:** was assessed based on their responses to questions on whether they fact of having ever heard of rabies or not, the ability to quote animals that can transmit rabies and transmission routes, and their description of the severity of the disease.

**The perceptions of bite case management:** were assessed based on their responses to questions on the first care to be provided to bite victims, the action to be taken after the first care, the action to be taken regarding the biting animal, and the main challenges to PEP coverage.

**Understanding of rabies prevention in pets:** was assessed based on their responses to questions on the preventive measures, the age of vaccination, and the willingness to pay for pet vaccination.

### 5. Study Instruments

The research instruments included a questionnaire (with both closed-ended and open questions) used for data collection through a household survey (face-to-face interview). The interview was conducted in a language understandable to each participant. To this purpose, six human health and animal health students, all members of Rabies Free Burkina, were trained to conduct the interviews in the households. The research team was assisted by a local animal health officer well known to the community.

### 6. Data Analysis

The collected data with the open-source ODK-installed tablets were stored in a centralized database. Subsequently, data were exported into MS Excel (Microsoft, 2016) for processing. For the assessment of

the knowledge, attitudes, and practices, the answers provided by the participants were classified according to their accuracy and completeness. The association between the independent variables (gender, level of education, professional status, dog-owning status) and dependent variables (Table 1) was determined using the Chi-Square test. All statistical analyses were performed using Rx4.1.0 software and the significance level was set at 0.05.

### 7. Research Ethics

The questionnaire used in this study is part of a research protocol approved by the Research Ethical Committee of Université Cheikh Anta Diop (Protocole-0322/2018/CER/UCAD). In addition, before each interview, participants were informed about the background and purpose of the study, highlighting that participation was voluntary, and individual data would be kept confidential. Thus, verbal informed consent was obtained by the interviewers at the start of each interview.

## RESULTS

### 1. Key information emerged from the outbreak investigation

On 11 October 2021, an animal health officer of the Rural Commune of Sabou was reach-

ed out by an owner about a sick goat. Reportedly, the observed clinical signs included aggressivity, bleating with severe tones, biting of the accessible parts of the body, and pronounced pica. This sick goat died on 16 October 2021 (5 days later). However, the animal health officer reported that due to technical issues, no brain sample was collected for laboratory confirmation of rabies. A day later, the veterinary office was contacted about a second goat presenting similar clinical signs. Suspecting rabies, the local animal officer who was familiar with Rabies Free Burkina Faso informed the association requesting support to investigate the case. Thus, the owner was approached and the goat was acquired. Subsequently, the goat was put under veterinary observation in the same veterinary office and reportedly died on 20 October 2021. A Fluorescent Antibody Test performed on a brain sample confirmed rabies infection in the goat (Figure 2 and Figure 3). During the joint investigation initiated, recommendations that emerged from discussions with stakeholders were related to the need to identify gaps in the knowledge of rabies among communities, and organize awareness activities for community members such as conducting regular mass dog rabies vaccination campaigns.



**Figure 2. Collection of brain sample from the suspected rabid goat**



**Figure 3. Positive sample observed using the Fluorescent Antibody Test**

**2. Assessment of knowledge, practices and attitudes among the community**

**a. Household and participant characteristics including dog ownership**

In the surveyed households a total of 3516 persons were recorded, corresponding to an average household size of 11 persons, with 48.1% of records being children under 15 years old. Of the 305 participants, 166

(54.4%) were males, and only 47.5% of the visited households owned a dog (Table 1). Most of dogs were partially confined in the owners’ home (54.5%) or free-roaming (37.9%). Regarding the professional status, most of the participants were agropastoralists (economic activities being cultivation and animal breeding). When asked about their education, most of the participant had reportedly a secondary studies level.

**Table 1. Characteristics of surveyed participants and households in the Commune of Sabou (n=305)**

Variable	Category	Frequency (n)	Percentage (%)
<b>Gender</b>	Female	139	45.6
	Male	166	54.4
<b>Level of education</b>	Primary	65	21.3
	Secondary	169	55.4
	University	15	4.9
	None	56	18.4
<b>Professional status</b>	Civil servant	59	19.3
	Tradesperson	71	23.3
	Agropastoralist	129	42.3
	Other	46	15.1
<b>Presence of dog in households</b>	Yes	145	47.5
	No	160	52.5
<b>Dog confinement status</b>	Free-roaming	55	37.9
	Confined during the night	79	54.5
	Confined 24 hours a day	11	7.6

### **b. Participant knowledge of rabies infection and severity**

Among the participants included in the survey, 38.4% reportedly attended at least once in a rabies awareness session. Nevertheless, most of the participants declared that they had ever heard about rabies (73.8%). Having ever heard about rabies was significantly associated with the level of education, professional status, and dog-owning status (Table 2a, Table 2b). The participants with higher education levels, those working as civil servants as well as those living in households where a dog was owned were more likely to be aware of rabies. When questioned on animal species that can transmit rabies to humans, only 8.2% of participants were able to cite at least 3 animal vectors (mostly dog, cat, and monkey). In addition, only 1.6% of participants were able to name the 3 common routes of transmission of rabies, namely bite, scratch, and liking. Participants from dog-owning households were more likely to be aware of categories of animals that can transmit rabies and the routes of transmission ( $p < 0.050$ ). No significant association was found between the knowledge (about animal vectors and routes of transmission) and participants' characteristics such as gender, level of education, and professional status. Concerning the severity of rabies, 63.9% of participants declared that any rabies case is inevitably fatal. The perception of rabies severity was significantly associated with level of education and professional status, civil servants and participants with university level of study being more likely to perceive rabies as a highly deadly disease ( $p < 0.05$ ).

### **c. Knowledge and perceptions on bite case management**

Concerning the first care that should be provided to bite victims, 16.1% of participants mentioned the adequate action to be

taken, i.e. washing the wound with soapy water. Unlike gender, education level, and household dog-owning status, professional status was significantly associated with the knowledge of the first action to be taken for bite victims. Indeed, civil servants were more likely to know the first care in case of a dog bite ( $p < 0.05$ ). Visiting a health center or a veterinary office was cited as an action to come after the wound washing, by 81.3% and 15.4% of participants, respectively. Regarding the main constraints to PEP accessibility, vaccine shortage, and vaccine cost were raised by 39.7% and 60.3% of participants, respectively. However, no significant association was observed between participant characteristics and their perceptions of actions to be taken after wound washing and on constraints that hinder the PEP coverage among bite victims (Table 3a, Table 3b). When it comes to the management of a biting animal, while 58.3% of participants considered that they should be killed, only 28.8% believed that they should be put under veterinary observation. Regarding professional status, civil servants were more likely to know that veterinary observation was the right way in terms of biting animal management ( $p < 0.050$ ).

### **d. Perceptions and practices regarding rabies prevention in pets**

Rabies vaccination and confinement of owned pets in households were cited as measures to prevent rabies in pets, by 49.5% and 10.2% of the participants, respectively. However, 40.3% of participants were not aware of pet rabies prevention. The level of education was significantly associated with the knowledge of preventive measures, and participants having a university level of study were more likely to consider vaccination as a method to prevent rabies in pets ( $p < 0.050$ ). When asked about the minimum age required for the vaccination of pet in Burkina Faso, only

36.4% of participants mentioned 3 months old and over. The knowledge of the age for pet rabies vaccination was significantly associated with household dog-owning status, with participants from owned-dog households being more likely to be aware of the required age for rabies vaccination in

pets ( $p < 0.050$ , Table 4). Finally, of 145 dog-owning households, 67.6% reportedly vaccinated their dogs against rabies. Moreover, regarding the willingness to pay for pet rabies vaccination, 56.7% wished the price of the vaccine to not exceed 1.5 euros (1,000XOF).

**Table 2a. Factors associated with individual knowledge of rabies in the Commune of Sabou**

Variable	Category	Have ever heard about rabies			Animal vectors			
		Yes (%)	No (%)	P	≥ 3 cited (%)	1- 2 cited (%)	None (%)	P
<b>Gender</b>	Female	75.5	24.5	0.520	7.9	77.0	15.1	0.950
	Male	72.3	27.7		8.4	77.7	13.9	
<b>Level of education</b>	Primary	73.8	26.2	0.000	0.0	86.2	13.8	NA
	Secondary	82.2	17.8		11.2	78.7	10.1	
	University	100.0	0.0		33.3	66.7	0.0	
	None	41.1	58.9		1.8	66.1	32.1	
<b>Professional status</b>	Civil servant	88.1	11.9	0.020	20.3	69.5	10.2	NA
	Tradesperson	74.6	25.4		1.4	84.5	14.1	
	Agropastoralist	66.7	33.3		3.9	77.5	18.6	
	Other	73.9	26.1		15.2	76.1	8.7	
<b>The presence of dog in the household</b>	Yes	82.6	17.4	0.000	8.3	84.0	7.6	0.001
	No	66.2	33.8		8.1	71.9	20.0	

**Table 2b. Factors associated with individual knowledge of rabies in the Commune of Sabou**

Variable	Category	Routes of transmission					Severity of rabies			
		≥ 3 cited (%)	3 cited (%)	2 cited (%)	1 cited (%)	None (%)	P	Fatal (%)	Can be treated (%)	P
<b>Gender</b>	Female	7.9	1.4	16.5	58.3	23.7	0.830	69.1	30.9	0.080
	Male	8.4	1.8	20.5	55.4	22.3		59.6	40.4	
<b>Level of education</b>	Primary	0.0	5.1	27.1	59.3	8.5	NA	63.1	36.9	NA
	Secondary	11.2	0.0	8.5	67.6	23.9		70.4	26.6	
	University	33.3	0.8	19.4	50.4	29.5		86.7	13.6	
	None	1.8	2.2	21.7	54.3	21.7		39.3	60.7	
<b>Professional status</b>	Civil servant	20.3	5.1	27.1	59.3	8.5	NA	78.0	22.0	0.020
	Tradesperson	1.4	0.0	8.5	67.6	23.9		64.8	35.2	
	Agropastoralist	3.9	0.8	19.4	50.4	29.5		55.0	45.0	
	Other	15.2	2.2	21.7	54.3	21.7		69.6	30.4	
<b>The presence of dog in the household</b>	Yes	8.3	0.7	20.8	65.3	13.2	0.000	60.6	39.4	0.180
	No	8.1	2.5	16.9	49.4	31.2		68.1	31.9	

**Table 3a. Perceptions on the management of bite cases in the Commune of Sabou**

Variable	Category	First, care to be provided to bite victims			Action to be taken after the first care			
		Adequate action cited	Inadequate or no action cited	p	To visit a health center	To visit a veterinary office	Don't know	p
<b>Gender</b>	Female	13.7	86.3	0.290	84.2	11.5	4.3	0.160
	Male	18.1	81.9		78.9	18.7	2.4	
<b>Level of education</b>	Primary	10.8	89.2	0.130	83.1	12.3	4.6	0.360
	Secondary	20.1	79.9		77.5	19.5	3.0	
	University	20.0	80.0		86.7	13.3	0.0	
	None	8.9	91.1		89.3	7.1	3.6	
<b>Professional status</b>	Civil servant	33.9	66.1	0.000	76.3	22.0	1.7	0.740
	Tradesperson	8.5	91.5		83.1	14.1	2.8	
	Agropastoralist	16.3	83.7		81.4	14.7	3.9	
	Other	4.3	95.7		84.8	10.9	4.3	
<b>Presence of dogs in the household</b>	Yes	16.0	84.0	0.950	79.2	17.3	3.5	0.670
	No	16.2	83.8		83.1	13.8	3.1	

**Table 3b. Perceptions on the management of bite cases in the Commune of Sabou**

Variable	Category	Action to be taken regarding the biting animal				Main challenges to PEP coverage		
		Veterinary observation	Culling	No action	p	Vaccine shortage	Expensive cost	p
<b>Gender</b>	Female	25.2	56.1	18.7	0.420	39.6	60.4	0.970
	Male	31.9	51.8	16.3		39.8	60.2	
<b>Level of education</b>	Primary	20.0	58.5	21.5	0.000	33.8	66.2	0.750
	Secondary	33.7	50.9	15.4		41.4	58.6	
	University	80.0	20.0	0.0		40.0	60.0	
	None	10.7	66.1	23.2		41.1	58.9	
<b>Professional status</b>	Civil servant	57.6	33.9	8.5	0.000	42.4	57.6	0.950
	Tradesperson	18.3	62.0	19.7		39.4	60.6	
	Agropastoralist	23.3	55.0	21.7		39.5	60.5	
	Other	23.9	63.0	13.0		37.0	63.0	
<b>Presence of dogs in the household</b>	Yes	27.5	50.6	21.9	0.060	37.5	62.5	0.500
	No	30.6	57.6	11.8		41.2	58.8	

**Table 4. Prevention of rabies in domestic carnivores in the Commune of Sabou**

Variable	Category	Preventive measures				Minimum age recommended for primo-vaccination			
		Vaccination (%)	Confinement (%)	Don't know (%)	p	3 months and over (%)	< 3 months (%)	Don't know (%)	p
<b>Gender</b>	Female	54.0	10.7	35.3	0.250	30.9	9.4	59.7	0.010
	Male	45.8	9.6	44.6		41.0	11.4	47.6	
<b>Level of education</b>	Primary	46.2	6.2	47.7	0.000	27.7	16.9	55.4	NA
	Secondary	55.6	11.8	32.5		44.4	10.1	45.6	
	University	80.0	0.0	20.0		6.7	6.7	86.7	
	None	26.8	12.5	60.7		30.4	5.4	64.3	
<b>Professional status</b>	Civil servant	59.3	11.9	28.8	0.140	28.8	5.1	66.1	NA
	Tradesperson	53.5	7.0	39.4		36.6	9.9	53.5	
	Agropastoralist	40.3	11.6	48.1		38.8	14.7	46.5	
	Other	56.5	8.7	34.8		39.1	6.5	54.3	
<b>Presence of dogs in the household</b>	Yes	56.2	8.3	35.4	0.080	53.5	18.1	28.5	0.000
	No	43.8	11.9	44.4		21.2	3.8	75.0	

## DISCUSSION

The paper reports on the contribution of a One Health-oriented civil society association to the management of a rabies outbreak, including laboratory confirmation, joint investigation for multisectoral and multi-professional engagement as well as a survey assessing knowledge, attitudes, and practices regarding rabies prevention and control in the local community. To the best of our knowledge, this is the very first rabies outbreak investigation conducted in Burkina Faso. In addition, it resulted in an immersion in the local community through a survey assessing their awareness of the disease. The relevance of joint investigation for improved rabies surveillance, in terms of capturing reliable information regarding bite or outbreak events, was demonstrated through the implementation of One Health-based rabies control approaches (e.g. Integrated Bite Case Management) in Chad, Philippines, and Tanzania (Lechenne et al., 2017; Lushasi et al., 2020; Rysava et al., 2022). Performing a study in which conclusions could be drawn on the cooperation between a civil society association, animal health agencies, human health agencies, as well as community members, poses a unique challenge since the country did not yet have any integrated strategic plan for rabies control that highlights stakeholder's roles and responsibilities. Nevertheless, the role of the cooperation between public and private entities in improving rabies control was reported in 2013 by Taylor and Partners for Rabies Prevention (Taylor et al., 2013).

While previous studies investigated the knowledge and practices about rabies among communities (Savadogo et al., 2020; Dahourou et al., 2021; Savadogo et al., 2021b) and professionals both in animal and human health sectors (Savadogo et al., 2021a), none was conducted in a context of response to a rabies outbreak. The involve-

ment of community members in the investigation process (veterinary observation of the suspected goat, laboratory confirmation of the infection, outbreak joint investigation), the very first in the country to the best of our knowledge, may contribute to defeating the misconceptions about animal-transmitted human rabies. As reported by several rabies control initiatives, such misconceptions among the communities constitute major hindrances to the seeking for dog vaccination, the postexposure prophylaxis for bite victims, and the effectiveness of control programs (Savadogo et al., 2022; Bitek et al., 2018; Suseno et al., 2019; N'Guessan et al., 2022).

Moreover, although human rabies is mainly caused by dog in the African context, the detection of rabies in goats calls for increased actions to prevent animal losses from such a deadly disease (Shwiff et al., 2013; Hampson et al., 2015). Indeed, livestock remains the main source of income for most rural community members in the study area. Therefore, awareness messages should be developed to promote adequate animal ownership in communities (including dog rabies vaccination, and dog confinement to prevent contact between livestock and rabid dogs). The management of this rabies event is a success story in terms of multisectoral engagement and rapid response actions. These actions included a survey assessing the knowledge, attitudes, and practices, as well as short campaigns vaccinating owned dogs and sensitizing the general public about rabies prevention.

The household survey revealed an important proportion of dog-owning households in the community. Higher statistics about dog ownership were previously reported in different areas of the country (Dahourou et al., 2021; Savadogo et al., 2021c; Savadogo et al., 2021d). These observations suggest the occurrence of close

interactions between livestock, dogs and humans. Meanwhile, the study indicated that the participants did not have adequate knowledge about animals that can transmit rabies to humans and the routes of transmission. As previously reported (Al-Mustapha et al., 2021), the level of knowledge in this study was higher in households that owned dogs, which can be explained by the fact that when seeking veterinary care for pets, owners may have been sensitized to rabies. This highlights the need for increased awareness campaigns sharing useful messages on rabies prevention in both animals and humans (Matibag et al., 2009) as well as improved geographical and financial access to veterinary and medical services, mostly in the currently underserved rural communities. In addition, the knowledge of rabies among participants was more likely to be promoted by a higher level of education. This reveals the extent of the challenge to rabies elimination in relation to the decreasing access to education in vulnerable communities as well as to the continued closure of educational facilities in the last few years in the country (over 20,000 schools closed during the COVID-19 pandemic and 6,253 due to the security crisis that started in 2016) (Burkina Faso, 2022b). The role of education in increasing community health literacy and defeating health misconceptions was reported by several studies (Dzikwi et al., 2012; Hasanov et al., 2018; Amparo et al., 2019; Bouaddi et al., 2020).

Knowledge about bite case management was unsatisfactory, and most of the participants were not aware of the need for immediate wound washing with water and soap, after a dog bite, to reduce the risk of infection. The same awareness gaps were reported in the country, for example in Ouagadougou (Savadogo et al., 2020), in Bobo Dioulasso (Savadogo et al., 2021d), and in Dedougou (Dahourou et al., 2021).

This situation is not surprising with regard to the chronic lack of sustained awareness campaigns. In a context characterized by dog free-roaming (Sondo et al., 2015), low vaccination coverage in dog (Savadogo et al., 2021c; Dahourou et al., 2021; Savadogo et al., 2021d), and repeated postexposure prophylaxis shortages (Sondo et al., 2014; RSTMH, 2021), such awareness gaps may highly exposes communities to rabies infection. The study also indicated that following a bite occurrence, the community members used to visit medical centers or veterinary offices. All these observations provide insights into the need for increased education on bite management and improved collaboration between medical and veterinary services to ensure timely postexposure prophylaxis to bite victims. So far, it is globally recognized that strengthened One Health capacities represent the best way for the effective control of dog-mediated human rabies as per the international community's target of zero human deaths from rabies by 2030 (Acharya et al., 2020; WHO, 2015). In this perspective, canine rabies endemic countries are expected to develop integrated strategic plans that include aspects related to data collection, pre-exposure prophylaxis, postexposure prophylaxis, legislation, laboratory testing, awareness raising, dog population management, dog vaccination, as well as collaboration across human and animal health sectors and other relevant stakeholders (Chen et al., 2021).

Dog-mediated human rabies can be eliminated whether canine populations are made free from the rabies virus. It is particularly known that, in a given rabies-endemic area, sustained vaccination coverage of over 70% in dogs results in the disruption of the transmission cycle of rabies from dogs to humans (Zinsstag et al., 2017; González-Roldán et al., 2021). Unfortunately, in a large number of households,

people were not well aware of dog vaccination. The same observation was reported from different areas of the country (Savadogo et al., 2020; Dahourou et al., 2021). Would this be the reason for the low dog vaccination coverage recorded from owned dogs in several locations of the country (Dahourou et al., 2021)? Whether it is true that lack of knowledge among dog owners could be an obstacle to dog vaccination, it is critical to improve the availability of vaccines and geographical and financial accessibility to veterinary services (Mosimann et al., 2017; Savadogo et al., 2022). Indeed, while participants reportedly were willing to pay a maximum of 1.5 euros for their dog vaccination, the average cost in the private veterinary clinics was ten times higher (Savadogo et al., 2020). Therefore, it is time to explore opportunities for improving not only the availability of the vaccine but also its financial acceptability for increased pet vaccination coverage, as the best way to eliminate dog-mediated human rabies according to the global target of zero human rabies by 2030.

The study confirmed a rabies outbreak in the Rural Commune of Sabou. The piloted joint investigation conducted indicates that the organization of animal health and human health is favorable for local One Health interventions. From this perspective, it is essential to train professionals involved in rabies prevention and control on the core competencies required for integrated management of public health issues. In addition, the lack of knowledge and practical gaps identified through the household survey can be effectively addressed whether the integrated national strategic plan for the elimination of dog-mediated human rabies is appropriately implemented. In the short term, this pilot initiative should be strengthened and serve as a model for the operationalization of an integrated management

of rabies both in animals and humans in Burkina Faso.

#### **AUTHOR CONTRIBUTION**

Madi Savadogo conceptualized the study, supervised the data collection, analyzed the data, and wrote the manuscript. Guy Sidwatta Ilboudo and Hamidou Zangré proposed the research instruments. Kalidou Zerbo surveyed data collection. Laibané Dieudonné Dahourou, Abdoul Kader Ilboudo, and Zékiba Tarnagda contributed to writing and reviewing the manuscript. All authors read and approved the manuscript.

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#### **CONFLICT OF INTEREST**

None declared.

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