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Dog ownership, demographics, owners' knowledge of rabies, and factors associated with canine rabies vaccination in urban and rural areas of Dedougou, Burkina Faso

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ABSTRACT

Rabies is a prioritized zoonotic disease in Burkina Faso and is known as a major zoonotic disease with high public health importance. This investigation was conducted to assess community knowledge, dog ecology and demographics, and factors associated with dog vaccination against rabies in the urban and rural areas of Dedougou. Three hundred and sixteen (316) dog-owning households were surveyed in the rural and urban areas of Dedougou using a semi-structured questionnaire. Among participants, 55.7% lived in rural area, and 59.8% were farmers. Only 34.5% of participants had satisfactory knowledge of rabies. About 22% were aware of the required age of dogs' primo vaccination against rabies while 55.7% knew the frequency of booster vaccination. Participants living in households with less than five persons were significantly more likely to be aware of rabies than those living in households with the higher number of persons ($P<0.05$). Participants who were aware of rabies were more likely to vaccinate their dogs compared to those who were not aware of rabies ($P<0.05$). In total, 2930 persons were recorded in visited households with 60.6% from rural area, and an average household size of 9.27 persons. Three hundred and thirty seven dogs were found in surveyed households' and 54.9% were from rural area. In overall, a dog per human ratio of 1:8.7 was determinated. Regarding dog ownership practices, the majority of respondents reported that they provided their dogs with water (84.5%) and food (84.8%). This research reported supplementary data on dog ecology and rabies, which could be useful for rabies control planning in Burkina Faso.

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Introduction

Rabies is a fatal nervous disease affecting warm-blooded animals including human. It is caused by a virus, belonging to the family of Rhabdoviridae, the genus of *Lyssavirus*. Rabies causes every year about 59′000 human deaths worldwide and Africa is one of the most affected continents with more than a third of worldwide human cases (Hampson et al., 2015). To date, all African mainland countries are considered endemic for dog-mediated rabies. Rabies transmission usually occurs through the percutaneous bite of a rabid mammal excreting the virus in its saliva (Robertson, Marano & Johnson, 2012). Non-bite exposures such as scratches and licks can also lead to rabies infection, although less frequently reported than bites. Throughout Africa and Asia, dogs are the main reservoir of rabies and are responsible for over 99% of human cases (Minghui, Stone, Semedo & Nel, 2018).

Regarding the high impact of rabies, different control strategies have been developed. For many years, control of rabies focused on canine mass vaccination, dogs' movement restriction and control of roaming dogs. These measures have been effectively applied in developed countries, resulting in effective control and elimination of animal and human rabies (Kitala et al., 2001). However, in many African countries, canine rabies control measures have not been effective, the disease remaining endemic. This could be explained by planning issues due to limited data on dogs ecology and demography (Gsell et al., 2012; Kitala et al., 2001).

Understanding dog demography, ecology and dog ownership practices could inform the planning, implementation and monitoring of rabies control programs (Morters et al., 2014). In addition, knowledge of canine population size can help in planning costs and resources needed for mass vaccination implementation. Indeed, dog vaccination is known to be effective pathway to achieve the break in the epidemiological cycle that could lead to eliminate human dog-mediated rabies (Cleaveland, Kaare, Knobel & Laurenson, 2006). According to Kaare et al. (Kaare et al., 2009a) the coverage of vaccinated dog required to eliminate canine rabies and prevent future outbreaks is predicted to be around 70%.

In Burkina Faso, dogs are owned in the urban and rural areas for different socioeconomic reasons including house or herd guarding, hunting, sacrifices during traditional meetings, companionship especially for children and consumption as a source of protein. However, no data is available regarding dog ecology and demography. In the country, rabies is known to be endemic in rural and urban area as reported in different studies (Mamoudou & Boushab, 2015; Savadogo et al., 2020; Sondo et al., 2015). Aiming to inform dog population management, prevention and control strategies, the present study was conducted to assess people knowledge, dog ecology and demography, and factors associated with dog rabies vaccination in urban and rural areas of Dedougou.

Material and methods

Study area and period

The investigation was conducted from June to September 2020 in both urban and rural areas of Dedougou, Burkina Faso. Dedougou is the administrative capital of Mouhoun province, and Boucle du Mouhoun region. It is located at 230 km from Ouagadougou, the administrative capital of the country and from 175 Km from Bobo-Dioulasso, the second biggest city of Burkina Faso. The city of Dedougou covers 1352.56 km^2. The peri-urban area of Dedougou includes thirty-seven villages while the urban area is divided into seven districts. The population of Dedougou is estimated at 124,090 inhabitants in 2019 with more than 44% living in the urban area. At least 45% of people in the study areas were 14 years old and lower.

Sampling and data collection

A cross-sectional study was conducted in the urban area and 15 villages, randomly selected in the rural area. Only dog-owning households were included in this study. In the urban area, 20 households were selected in each district while 10 to 12 households were selected in each village in the rural area. During the investigation, in each village or districts in urban area, the sampling point was chosen at random in one of the village or districts angle. The first own dog household were chosen at random and then the third own dog households were chosen according to household distribution. In total, 316 households were surveyed with 140 in the urban area and 176 in the rural area. In each selected household, the head of the household was interviewed and when they were absent, another household member who agreed to participate was interviewed. In each selected district or village, a first dog-owning household was identified and surveyed. Then, each third dog-owning household was surveyed. Using a structured questionnaire, data were collected through a face-to-face interviews in language understandable to participants (French or local language). The questionnaire was designed to collect data on individual characteristics (location, gender, and age), households' characteristics, knowledge of rabies, canine ecology and demography, data on owned dog vaccination against rabies and human exposition to rabies in the households.

Data analysis

For the assessment of people knowledge of rabies, scores were given according to the completeness and accuracy of respondents' answers, ranging from zero to three. In total, 12 questions were used for this section as shown in table 1. When all questions were correctly answered, a respondent would obtain overall scores of 23. For a respondent to be classified as knowledgeable about rabies, a minimum score of 14 out of 24 was required, which is equal to or more than 60% according to the cut-off point of the Likert-type scale (Sambo et al., 2014; Xiang et al., 2010). Regarding this, respondents were classified into two groups: satisfactory level of knowledge or unsatisfactory level of knowledge. Association between explanatory variables (location, gender, age, number of people in the household, educational level, occupation) and knowledge level of rabies was assessed using the Chi-square test. Dogs vaccination status was classified as vaccinated (if an up-to-date vaccination certificate was presented), unvaccinated (if owners reported their dogs were not vaccinated or presented an invalid vaccination certificate) or doubtful (if owners reported their dogs were vaccinated without presenting a vaccination certificate). Association between explanatory variables and dog vaccination status was assessed using the Chi-square test. All statistical analysis were performed using R 2.13.0 software and the significance level was set at 0.05. Based on the size of the dog and human population in the households, dog:human ratio was calculated, dividing the total number of persons recorded in households by the number of dogs counted. Then, the number of dogs in the commune of Dedougou was estimated using the calculated dog: human ratio and the total human population of the commune of Dedougou (Kwaghe et al., 2019; Otolorin, Umoh & Dzikwi, 2014; Ratsitorahina et al., 2009).

Results

Households and participants characteristics

In this investigation, 55.7% of participants were from rural area (Table 2). Most of interviewees were male (85.1%) and farmers (59.8%). The average age of respondents was 43.6 years old and most of respondents were 45 years old and over (46.2%). Regarding educational level, only 4.4% attended university studies while 47.8% were illiterate. Regarding household, 80.1% of households were fenced while only 46.2% had a door. In visited households, a total of 2930 people were recorded from which 1777 (60.6%) lived in rural households. The

Table 1
Questions asked for the assessment of people knowledge on rabies.

Number	Questions	Score for incorrect answer	Score for one correct answer	Score for two correct answer	Score for three correct answer
1	Vectors of rabies	0	1	2	3
2	Canine rabies could be transmitted to human?	0	1	Not applicable	Not applicable
3	Modes of transmission of rabies to human	0	1	2	3
4	Modes of transmission of rabies to dogs	0	1	2	3
5	Clinical signs of rabies in dogs	0	1	2	3
6	Rabies is fatal disease when clinical signs appear?	0	1	Not applicable	Not applicable
7	How dogs can be protected from rabies?	0	1	2	Not applicable
8	Is there any vaccine against dogs rabies	0	1	Not applicable	Not applicable
9	Is there any vaccine against human rabies	0	1	Not applicable	Not applicable
10	Prevention practices after dogs bite	0	1	2	3
11	Required dog age for first vaccination against rabies	0	1	Not applicable	Not applicable
12	Frequency of booster vaccination against rabies in dogs	0	1	Not applicable	Not applicable

average household size was 9.27, with respectively, 10.1 and 8.23 persons in rural area and urban area.

Dog ownership, husbandry practices and perceived problems associated with dogs owning

Data on dogs' ownership and demographics are reported in Table 3. In this work, 337 dogs were recorded in surveyed households with 185 (54.9%) in rural area. Dogs were acquired through gift (36.2%) and purchasing (63.8%). A dog per household ratio of 1.05 and 1.08 was obtained in rural and urban communities, respectively. The overall dog per person was 1:8.7 (Table 6). Concerning dog confinement status, 71.4% of dogs were roaming at times while 14.3% were free-roaming. With regard to the household location, 51.1% of free-roaming dogs were more likely to be found in rural area ($P>0.05$).

The majority of respondents reported that they provided their dogs with water (84.5%) and food (84.8%). Only 5.7% reportedly provided their dogs with veterinary care while 15.2% provided no care to their dogs. In addition, 3.5% of respondents reported that they provided care to community dogs, including water (1%) and food (2.8%) and care provided was water. During the last year before the study, 9.5% of respondents reported lost at least one dog. The most cited causes of dog death were diseases (60%), motorbike or car accident (20%). Only 3.2% reported that they lost their dogs with symptoms similar to rabies clinical signs.

Table 2
Characteristics of households and study participants.

Variables	Number observed (%)
Area	
Urban	140 (44.3)
Rural	176 (55.7)
Type of households	
Fenced	253 (80.1)
Unfenced	63 (19.9)
Number of people living in household	
1–5	44 (13.9)
6–10	164 (51.9)
More than 10	108 (34.2)
Age class	
15 – 30 years	59 (18.7)
31 – 45 Years	111 (35.1)
More than 45 Years	146 (46.2)
Gender	
Male	269 (85.1)
Female	47 (14.9)
Education	
Illiterate	151 (47.8)
Elementary level	82 (26.0)
Secondary level	69 (21.8)
University level	14 (4.4)
Occupation	
Farmers	189 (59.8)
Civil servants*	16 (5.1)
Workman**	93 (29.4)
Students	18 (5.7)

*Civil servants refers to workers in Burkina Faso administration and Workers.
** This refers to employee of private companies, shopkeepers, mason, etc.

Table 3
Demographics of dog-owning households.

Variables	Rural (%)	Urban (%)	Total
Number of households	176 (55.7)	140 (44.3)	316
Number of people living in household	1777 (60.6)	1153 (39.4)	2930
Average number of person per household	10.1	8.23	9.27
Number of dogs in household	185 (54.9)	152 (45.1)	337
Average number of dogs per household	1.05	1.08	1.06
Dog per persons ratio	1:9.6	1:7.6	1:8.7
Dog confinement status			
Free-roaming	23 (51.1)	22 (48.9)	45 (14.3)
Roaming at times	128 (56.9)	97 (43.1)	225 (71.4)
Fully confined	26 (56.5)	20 (43.5)	46 (14.3)
Estimated human population size in Dedougou	–	–	118 727
Estimated dog population in Dedougou			13 647

Concerning the perceived issues associated with dogs, 99.4% of participants considered dog roaming as an issue as they disseminate rabies (88.3%), cause traffic accidents (21.8%), and attack people (23.73%). For roaming dog control, participants thought that it should be done by the municipality (81.0%), dog owners (9.5%) and government (6.5%), respectively. Community sensitization (42.4%), roaming dog culling (54.1%) and confinement (7.6%) were cited as control methods of dogs roaming.

Participant's knowledge of rabies

Overall, only 34.5% of participants had satisfactory knowledge of rabies. Only 8.2% knew at least three rabies vectors, and 65.5% knew two clinical signs of rabid dogs and aggressiveness of dogs was the most cited sign (Table 4). Regarding rabies vaccination, 82.9% and 62.3% knew that vaccine exists for dogs and human, respectively. Only 22.1% of participants had satisfactory knowledge of the required age of primo

Table 4
Scores given to participants' knowledge on rabies in urban and rural areas of Dedougou.

Variables	Number observed (%)
Vectors of rabies	
0	11 (3.5)
1	196 (62.0)
2	83 (26.3)
3	26 (8.2)
Modes of transmission of rabies to human	
0	9 (2.8)
1	257 (81.3)
2	48 (15.2)
3	2 (0.6)
Modes of transmission of rabies to dogs	
0	24 (7.6)
1	203 (64.2)
2	82 (26.0)
3	7 (2.2)
Clinical signs of rabies in dogs	
0	10 (3.2)
1	70 (22.1)
2	207 (65.5)
3	29 (9.2)
Rabies is fatal disease when clinical signs appear?	
0	19 (6.0)
1	297 (94.0)
How dogs be protected from rabies	
0	27 (8.5)
1	237 (75.0)
2	52 (16.5)
Prevention practices after dogs bite	
0	22 (7.0)
1	163 (51.6)
2	131 (41.5)
3	0
Required dog age of dog for first vaccination against rabies	
0	246 (77.8)
1	70 (22.2)
Frequency of booster vaccination against rabies in dogs	
0	140 (44.3)
1	176 (55.7)

vaccination against rabies in dogs, while 55.7% knew the frequency of booster vaccination. In addition, 81.3% of participants knew one mode of transmission to dogs, while 2.8% did not know any transmission mode. Most of participant (92.7%) reported that rabies is transmissible to human. Concerning the mode transmission of rabies to human, 64.2% knew one transmission mode; whereas 7.6% did not know any transmission mode. The majority of interviewees (94%) knew that rabies is fatal once clinical signs appear. Regarding prevention practices after dog bite, 41.5% knew two prevention practices.

Various factors were associated with level of knowledge about rabies as reported on table 5. Participants from urban area (40.7%) were significantly more likely to know about rabies than those living rural area (29.5%) ($P<0.05$). Also, satisfactory level of knowledge about rabies was significantly higher in participants of less than 30 years old (50.8%) compared to older participants ($P<0.05$). The proportion of participant with satisfactory level of knowledge about rabies was also significantly higher in participants with secondary (72.5%) and university (87.7%) study levels ($P<0.05$). In addition, the study showed that the participants in households with less than five persons (50%) were significantly more likely to know about rabies than those living in households with 6 to10 persons (35.4%) and more than ten persons (26.9%) ($P<0.05$). Also, the proportion of participants with satisfactory level of knowledge about rabies was also significantly higher in students (55.6%) and civil servants (93.8%) compared to others ($P<0.05$). Male (34.9%) were more likely to know about rabies than female (31.9%), but no significant association was determinated ($P>0.05$).

Table 5
Factors associated with participants' knowledge of rabies in urban and rural area of Dedougou.

Variables/ Modality	Number	Knowledgeable (%)	χ2 (P value)
Area			4.3 (0.030)
Urban	140	57 (40.7)	
Rural	176	52 (29.5)	
Number of people living in household	44	22 (50)	7.52 (0.020)
1–5	164	58 (35.4)	
6–10	108	29 (26.9)	
More than 10			
Age class			
15 – 30 years	59	30 (50.8)	12.94
31 – 45 Years	111	42 (37.8)	(0.001)
More than 45 Years	146	37 (25.3)	
Gender			
Male	269	94 (34.5)	0.16 (0.680)
Female	47	15 (31.9)	
Education			82.4 (0.000)
Illiterate	151	27 (17.9)	
Elementary level	82	20 (24.4)	
Secondary level	69	50 (72.5)	
University level	14	12 (87.7)	
Occupation			40.22
Farmers	189	45 (23.8)	(0.000)
Civil servants	16	15 (93.8)	
Workers	39	39 (41.9)	
Students	18	10 (55.6)	

Dog rabies vaccination in rural and urban area of Dedougou city

From all participants, only 8.23% had reportedly vaccinated their dogs and presented a valid vaccination certificate while 4.11% owned dogs with doubtful vaccination status. Owners who reportedly did not vaccinate their dogs cited several reasons, and most cited reasons were the distance from home to vaccination sites (49.7%), negligence (23.7%), lack of money for vaccination payment (12.3%), uselessness of dogs' vaccination against rabies (9.8%), unavailability of vaccine against rabies (2.5), owned dogs being too young (1.9%).

The study revealed that dog vaccination status was significantly associated with participant level of knowledge of rabies. Participant with satisfactory level of knowledge of rabies (76.9%) were more likely to vaccinate their dogs compared to those who were less aware of rabies (23.1%), and the proportion of participants with unvaccinated dogs were significantly higher in less or no aware participants (71.5%) ($P<0.05$). Also, the proportion of participants who did not vaccinate their dogs was associated with the size of household, and the highest proportion of unvaccinated dog owners was found in households with more than five persons ($P<0.05$) (Table 6). Moreover, among unvaccinated dog owners, more than 80% had at least secondary level of study. Regarding occupation of participants, 46.2% of vaccinated dog owners were civil servants and most of unvaccinated dog owners were farmers (64.6%) ($P<0.05$). Concerning the origin of dog and the location of dog-owning household, purchased dogs (92%) and dogs owned by urban households (96.2%) were more likely to be vaccinated ($P<0.05$). Same proportions of vaccinated dog owners were found among participants who reportedly provided or not other veterinary care to their dogs. However, 98.2% of unvaccinated dog owners were participants who did not provide other veterinary care to their dogs ($P<0.05$). Discussion

Burkina Faso has been a rabies endemic country for decades. As a global target of zero human-dog mediated rabies elimination by 2030 was set, the country has implemented rabies control activities, which includes canine short vaccination campaigns, community awareness during yearly Word Rabies Day celebration. In addition, studies were carried out, focusing on laboratory surveillance of animal rabies (Germaine et al., 2021; Savadogo, Koné, et al., 2020), people knowledge, attitudes and practices (Savadogo, Koné, et al., 2020), factors associated

Table 6
Factors associated with dog vaccination status in rural and urban area of Dedougou.

Variables	Vaccinated (%)	Doubtful (%)	Unvaccinated (%)	χ2 (P value)
Awareness on rabies				35.444
Aware	20 (76.9)	10 (76.9)	79 (28.5)	(0.000)
Unaware	6 (23.1)	3 (23.1)	198 (71.5)	
Number of people				10.8
living in household	8 (30.8)	4 (30.8)	32 (11.6)	(0.028)
1–5	10 (38.5)	6 (46.2)	148 (53.4)	
6–10	8 (30.8)	3 (23.1)	97 (35.0)	
More than 10				
Education				87.79
Illiterate	3 (11.5)	1 (7.7)	147 (53.3)	(0.000)
Elementary level	2 (7.7)	3 (23.1)	77 (27.9)	
Secondary level	13 (50.0)	9 (69.2)	46 (16.7)	
University level	8 (30.8)	0	6 (2.1)	
Occupation				109.26
Farmers	4 (15.4)	6 (46.2)	179 (64.6)	(0.000)
Civil servants	12 (46.2)	1 (7.7)	3 (1.1)	
Workers	7 (26.9)	6 (46.2)	80 (28.9)	
Students	3 (11.5)	0	15 (5.4)	
Dog acquisition mode				10.76
Buy	23 (92.0)	10 (76.9)	168 (60.6)	(0.004)
Gift	2 (8.0)	3 (23.1)	109 (39.4)	
Area				33.5
Rural	1 (3.8)	5 (38.5)	170 (61.4)	(0.000)
Urban	25 (96.2)	8 (61.5)	107 (38.6)	
Providing other				103.6
veterinary care to	13 (50)	0	5 (1.8)	(0.00)
owned dogs	13 (50)	13 (100)	272 (98.2)	
Yes				
No				

with dog vaccination against rabies in two biggest cities of the country (Savadogo et al., 2021a; Savadogo et al., 2021b) , rabies virus phylogenetic and phylogeography (Benedictis et al., 2010; Bourhy et al., 2008) and collaboration between public health workers and veterinarian for rabies control (Coulibaly & Yameogo, 2000). Unfortunately, dog ecology and demography, people knowledge, and factors associated with dog vaccination in both rural and urban areas were not studied. According to Aréchiga Ceballos et al. (2014), canine demographics and owner provision of care are useful for characterizing the human–animal relationship and can vary greatly depending on cultural practices and beliefs. Moreover, according to Kaare et al. (2009b), the required dog vaccination coverage to eliminate rabies and prevent future outbreaks is predicted to be around 70%. In Burkina Faso, the proportion of vaccinated dogs is difficult to estimate, as data on dog population are not available. To better plan for dog rabies control, data on dog demographics, ecology, ownership and husbandry practices are required.

The present investigation revealed that 34.5% of dog owners had satisfactory knowledge level of rabies and 92.7% knew it is transmissible to human. Knowledge on rabies was significantly associated with living area and dog owners having satisfactory knowledge level of rabies were significantly higher in urban area compared to rural area. This could be explained by the accessibility to rabies-related information according to living area. Indeed, in Burkina Faso, yearly community awareness activities focused in urban area, especially Ouagadougou and Bobo Dioulasso. Moreover, most of people living in urban area have access to education and most of rabies information are available in French or other foreign languages. The study also showed that knowledge of rabies was better in people less than 30 years old as reported in previous studies in Burkina Faso (Savadogo et al., 2021a). Similar results were reported by Guadu et al. in Ethiopa (Guadu, Shite, Chanie, Bogale & Fentahun, 2014). Nowadays, information is widespread on social media, mostly used by young people, explaining that they could easily access rabies-related information (Duggan & Brenner, 2013; Owiny, 2014). The findings showed that people with at least secondary study level, those living in households with maximum five persons, students and civil servants had better knowledge of rabies. Similar results were reported by several authors in Africa (Ameh, Dzikwi & Umoh, 2014; Nejash, Boru, Jemal & Wezir, 2017) and Brazil (Costa & Fernandes, 2016).

Regarding canine vaccination, only 8.23% of dog owners vaccinated their dogs. This vaccination coverage is very low compared to World Health Organization recommended threshold coverage set at 70% (Kaare et al., 2009b). However, this coverage could be different from the field reality. Indeed, the vaccination coverage in the present research was calculated based on animal owners' declaration and presentation of up-to-date certificate. Therefore, vaccinated dogs might be wrongly classified as unvaccinated or doubtful for owner who loses the vaccination certificate. This could also occur in households where the person who keep animal vaccination certificate or is aware of the animal vaccination status was absent during the survey. In Burkina Faso, former studies found 25.9% and 47.2% of vaccinated coverage in Bobo Dioulasso (Savadogo et al., 2021b) and Ouagadougou (Savadogo et al., 2021a), respectively. This difference may be linked to accessibility of vaccine and veterinary services according to area. Ouagadougou and Bobo Dioulasso are the biggest towns of Burkina Faso, where most of private veterinarians, public veterinary offices, and central animal health institutions are located. Moreover, most of annual dog short vaccination campaigns are organized in Ouagadougou and Bobo Dioulasso. Furthermore, the main reason for dog non-vaccination was the distance to vaccination sites cited by 49.7% of dog owners. This was also observed by Savadogo et al., 2021a and Savadogo et al. (2020) who reported low vaccination coverage in dog-owning households located more than 10 km from vaccination services. Similar observations was also reported in Malawi by Mazeri et al. (Mazeri et al., 2018). Dog vaccination status was significantly associated with people's awareness level of rabies as reported by Savadogo et al. in Bobo Dioulasso (Savadogo et al., 2021aSavadogo et al., 2021a; Savadogo et al., 2021b) and Kazadi in DRC (Kazadi, Tshilenge, Mbao, Njoumemi & Masumu, 2017). These results suggest that rabies awareness or knowledge could lead in the increase of vaccination coverage and justify the importance of people sensitization in rabies control programs. This research found that educational level significantly influenced owner's decision to vaccinate their dogs against rabies. Indeed, dog owners who had at least secondary education level were more likely to vaccinate their dogs against rabies. This is not surprising as education has been reported as an important predictor of health decision making. According to Kazadi et al. (2017), people with higher educational level are more likely to adopt better health practices.

Our findings indicated that 80.1% of households were fenced while only 46.2% had a closing gate. This situation allows dogs to get out of the households for free-roaming and justify the important proportion of roaming dogs found in this study. Roaming dogs, beyond the fact of dissemination of rabies, are more difficult to handle during vaccination campaigns. The average number of dogs per household (1.06) was similar to previous findings in Bobo Dioulasso (Savadogo et al., 2021a) but lower than findings in Ouagadougou (1.4) (Savadogo et al., 2020), in Ghana (1.8) (Tasiame, Johnson, Burimuah, Akyereko & Amemor, 2019), in Nigeria (1.5) (Otolorin et al., 2014) and in Kenya (2.03) (Kitala et al., 2001) but higher compared to findings in Cameroon (0,63) (Bouli, Awah-Ndukum, Mingoas, Tejiokem & Tchoumboue, 2020). The overall dog per human ratio was 1:8.7 with 1:9.6 and 1:7.6 in rural and urban area, respectively. Previous studies found similar dog per human (1:8.6) in Cameroun (Bouli et al., 2020). However, Savadogo et al., 2021a found higher dog per human ratio Bobo Dioulasso (1:9.4), Burkina Faso and Otolorin et al. (2014) noted lower dog per human ratio in Nigeria (1:3.7). Regarding dog ownership practices, most of owners reportedly provided food and water to their dogs while only 5.7% provided their dogs with veterinary care. Up to 15.2% of owners provided, no care to their dogs and this could promote dog roaming, and therefore animal rabies dissemination and high risk of rabies transmission to human.

Conclusion

Our findings describe important data with could be useful for rabies control in Dedougou and in Burkina Faso in general. Important dog population hab been noted in the area and many factor are associated with people awareness on rabies. It is important to increase rabies control action in rural area. It will be also suitable to use different communication support and may be communication in local language during sensitization against rabies as many people in rural area had not or had low educational level. Also, dogs' vaccination campaigns against rabies, it will be important to set during these periods some vaccination points in villages. As dog population has been identified using ratios, it will be suitable that future studies focused on dog population estimation using capture and recapture technique.

Ethical consideration

Ethical approval was obtained from the Research Ethical Committee of Université Cheikh Anta Diop (Protocole-0322/2018/CER/UCAD). In addition, prior to each interview, participant were informed about the background and purpose of the study, highlighting that participation was voluntary, and would be kept confidential. Therefore, only participants who gave an oral consent for participation in the study were interviewed.

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Authors' contribution

LDD and MS designed the study performed data curation, statistical analysis and proposed the draft of the manuscript. Data have been collected by ZM, TASR, KAB and KA. Data were entered by GHV, OLB, OSH and validated by ZLH. All statistical analysis were validated by TA. All authors reviewed and approved the manuscript.

Declaration of Competing Interest

The authors declare that they have no competing interests.

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