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Rabies: knowledge, attitudes and practices in the Suhum municipality of Ghana

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Abstract

Aim: The world is racing behind time to get dog-mediated human rabies eradicated by 2030. In response, Ghana has developed a rabies control strategy that awaits implementation. The Ghana chapter of Rabies in West Africa piloted a 3-year One Health rabies control programme in Suhum Municipality of the Eastern Region, Ghana. Questionnaires were administered as part of the exercise to gather information on local rabies-related perceptions and practices, with the aim of identifying knowledge, attitude, and practice gaps that may antagonise control efforts and endanger human life.

Methods: A cross-sectional study was conducted from March to November 2020. The study involved 316 conveniently sampled households (individual per household) from three randomly selected sub-municipalities in Suhum Municipality. Data were analysed with IBM SPSS version 26.

Results: Of the 316 households interviewed, 82% (*n* = 259) of respondents were aware of rabies, of which 78.8% (*n* = 204) were found to have good knowledge about rabies. Rabies awareness was significantly associated with age (*P* = 0.004), sex (*P* = 0.042), and level of education (*P* = 0.0405). Although a majority (76.8%) of dog bite victims reported to the hospital, only 7.1% practiced wound cleansing while a significant number (32.2%) were involved in several myth-laden traditional remedies.

Conclusion: This study found that most of the respondents are aware and have good knowledge about rabies. However, their practices in disease prevention and control were poor. Continued and strengthened education through One-Health collaboration of stakeholders and the cooperation of the local community will be required for effective rabies control.

Keywords: Awareness, knowledge, practices, attitude, rabies, dog bite, Suhum Municipality

INTRODUCTION

The public health and economic burden of rabies are evident in developing countries where the disease is most prevalent, resulting in economic losses and the loss of over 60,000 human lives annually[1]. Rabies cost Ghana more than 16 million dollars annually[2].

Dogs are the source of rabies in 99% of human cases[3], and the most prudent way to control the disease in humans is, therefore, to eliminate the disease from dog populations through vaccination[4]. Rabies is recognised by WHO as a neglected tropical disease, and there is a global consensus led by WHO, OIE, FAO, and GARC to eliminate dog mediated rabies by 2030[5]. The final strategic plan to eliminate rabies was adopted in 2015 in a collaborative effort dubbed "United Against Rabies", which pledges international support while placing individual countries at the centre of action[1]. In response to the need for such collaborations, non-governmental organisations have been working in close association with governments to roll out rabies control exercises in most endemic regions.

The Suhum Municipality, located in the Eastern Region of Ghana, is rabies endemic with human-rabies to dog-bite ratio of 3:1000[6]. Hence the municipality has been a beneficiary of various rabies control partnerships, such as - the Rabies in West Africa (RIWA) - Suhum pilot rabies control project which commenced in 2017 with the aim of creating a network on rabies control in the Suhum Municipal District. The project, which lasted until 2019, involved various activities which exemplified combined stakeholder One Health efforts towards the prevention of human rabies by controlling the disease in dogs[7]. Although rabies perceptions and dog-keeping practices of at-risk populations are products of socio-cultural influences[8], not much work has been done in highlighting the knowledge, attitude and practices of Ghanaians on rabies. The objective of this study is to determine the knowledge, attitudes and practices of the people of Suhum Municipality regarding rabies and dog bites and explore the relationship between selected characteristics and knowledge, attitude, and practices regarding rabies and rabies control in the municipality. This is a baseline study that will serve as a foundation for further studies in Suhum Municipality and other parts of Ghana. The study will contribute information needed to develop rabies sensitisation content for rabies control at the local government and national level as the country is in the process of rolling out a national rabies control programme[9].

METHOD

Study location

The Suhum Municipal Assembly is part of the Eastern Region of Ghana; it is located between latitude 00561°N and 6008°N and longitude 00331°W and 00161°W, with a landmass of about 359Km^2 and a

population of about 90,358. The Municipality has 9 sub-municipalities under the operations of the Ghana Health Service, as depicted in Figure 1.

Study design and questionnaire

This research was conducted from March to November 2020 as a cross-sectional descriptive study to determine the knowledge, attitude and perception of rabies by residents of three sub-municipalities (Suhum Central, Nankese and Ayekotse) within the Suhum Municipality of the Eastern Region of Ghana [Figure 1].

The questionnaire included closed and open-ended questions in 5 parts under the headings: (i) general demographic information; (ii) household dog ownership information; (iii) rabies knowledge; (iv) awareness and knowledge information; (v) dog bite information and dog vaccination information which inform the respondents' attitudes and practices. A pre-test of the questionnaire was carried out on 30 respondents in a pilot study to assess any technical difficulties and revised appropriately.

Sampling

The outcome of the pilot study in which 80% of the population were aware of rabies was used at 95% confidence interval to determine the minimum sample size as 246 based on the formula $n_0 = \frac{Z^2 pq}{e^2}$ as proposed by Cochran (1977)[10]; where:

n_0 = *minimum sample size*
Z^2 = *zvalue obtained from a Ztable*
p = *expected proportion with attribute in question*
$q = 1 - p$
and *e=margin of error*.

Three sub-municipalities were selected using Research Randomizer an online software[11]. All the sub-municipalities in the Suhum Municipality were arranged in alphabetical order and assigned numbers from 1 to 9. The corresponding sub-municipalities to the numbers returned by the software were used in the study. Due to the absence of a list of all communities and households, representative communities and households were conveniently selected. In every community, the first accessible household was chosen. Movement continued in no particular order covering several communities within the same sub-municipality.

Data analysis

The data were manually coded into SPSS Statistics for Windows version 26 (IBM Corp. Armonk, N.Y., USA) and analysed. Where applicable, the Pearson's Chi-square test and Fisher's Exact Test were used to evaluate the statistical significance of differences in outcomes from selected characteristics at 5% level of significance. To determine the level of rabies knowledge among respondents, their responses to 5 questions pertaining to the local name of rabies, its main vector, mode of transmission and signs in animals and humans were assessed and scored. A score same as or above the median score, 3, was considered good knowledge while one below the median was considered poor knowledge.

Ethical permission

Written official permission was obtained from the municipal office of the Veterinary Services Directorate (Reference: MDA/SUMA/VSD/VOL.4/70). Informed verbal and/or written consent were acquired from each respondent before questionnaire administration, and they could decline participation and opt-out of survey at any time.

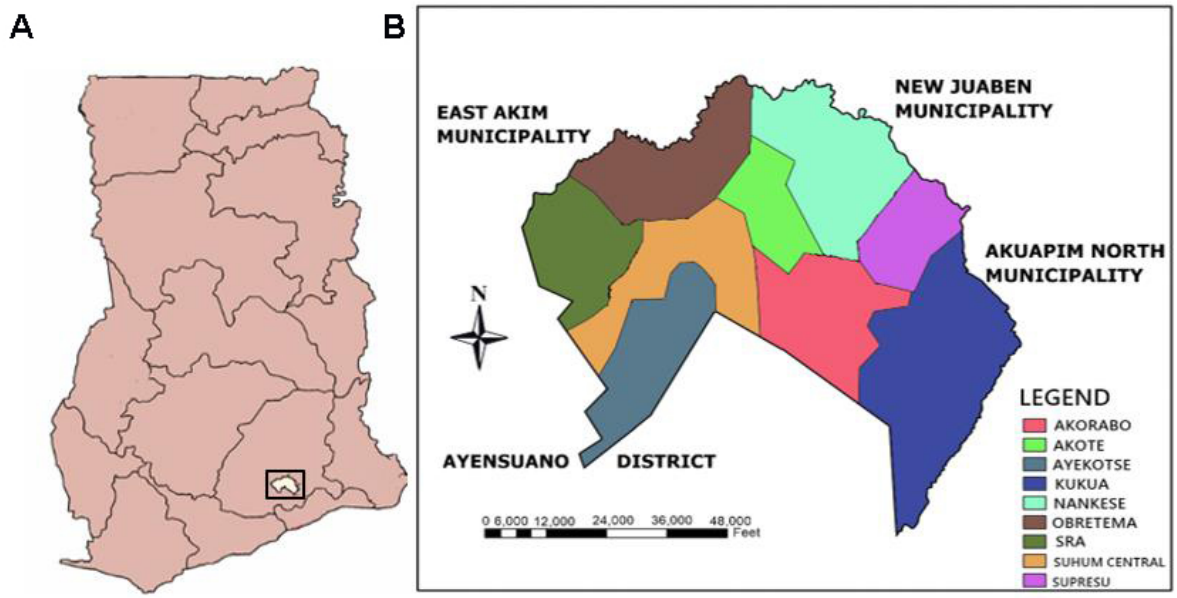

Figure 1. Map showing location of (A) Suhum as the white area in the rectangular box and (B) Sub-municipalities.

RESULTS

Demographic information

Table 1 summarises the background of respondents. In all, 316 people participated in the study of which 138 (43.7%) were males. The majority (43.4%) of the respondents were Junior high school (JHS) leavers while 12.3% had no formal education. The ages ranged from 16 to 90 years with 38 years as the median. Almost half (49.0%) of the participants were within the age bracket of 20-39 years. Only 28% of the respondents were from dog-owning households; 28.2%, 26.1% and 32.0% were in Suhum Central, Nankese, and Ayekotse, respectively. There were no significant differences across the three sub-municipalities.

Rabies awareness and knowledge information

With regards to knowledge about rabies, 80.0% (259/316) of respondents said they knew about the disease called rabies; 106, 65 and 88 from Suhum Central, Nankese, and Ayekotse, respectively. When further questioned about the local name of rabies, the majority 82.6% (214/259) of those who claimed to have some knowledge about rabies responded "I don't know." Second to this was 14.3% (37/259) respondents who gave "*Nkraman yareɛ*" which translates into English as *Dogs' Disease* as the name used by their people for rabies.

Dogs were known by 90% (233/259) of respondents as the main vector of rabies [Table 2]. That notwithstanding, 2.3% (6/259) of respondents believed rabies was mainly transmitted by juju or witchcraft. Other sources of rabies included animals such as cattle, chickens and snakes that formed 1.5% (5/259) of the responses. Similarly, on the transmission of rabies, a greater proportion, 90.7% (235/259) of respondents selected dog bite with 2.7% and 2.3% persons, respectively, agreeing rabies could be transmitted through scratches and licks of infected pets on broken skin.

Whereas 155 (59.8%) of 259 eligible respondents said they could tell a rabid dog by observing it for signs, 189 (73.0%) said they could also do the same for humans. The commonest source of rabies information for most respondents was neighbours and friends (66.3%), while 66 (25.5%) respondents, however, cited their own life experiences as source of their knowledge of rabies.

Table 1. Demographic data of respondents

	Frequency (*n* = 316)	Percent (%)
Age (in completed years)		
Under 20	25	7.9
20-29	87	27.5
30-39	68	21.5
40-49	56	17.7
50-50	38	12.0
60+	42	13.3
Sex		
Male	138	43.7
Female	178	56.3
Level of Education		
No formal	39	12.3
Primary	32	10.1
JHS	137	43.4
SHS	71	22.5
Tertiary	37	11.7
Sub-municipality		
Suhum Central	124	39.2
Nankese	92	29.7
Ayekotse	100	31.6

SHS: Senior High School; JHS: Junior High School.

Differences in demographic characteristics and rabies knowledge among the respondents

Regarding rabies awareness, Table 3 shows significant differences across age (P = 0.004), sex (P = 0.042), level of education (P = 0.0405) and sub-municipality of residence (P = 0.003) but not with dog ownership (P = 0.072). Further assessment revealed a significant relationship between the source of rabies information and rabies knowledge (P = 0.007) with no significant differences within the other selected characteristics. Based on the criteria used, 64.6% (204/316) of respondents and 78.8% (204/259) of those who knew about rabies had good knowledge of rabies.

Respondents who are 20-29 are 1.1 times more aware of rabies as compared to respondents under the age of 20. Respondents older than 60 were 1.1 times more likely to be aware of rabies as compared to respondents of age 24. Male respondents were 1.1 times more likely to be aware of rabies than females. On area of residence, respondents residing in Suhum and Ayekose were 1.2 times more likely to be aware of rabies than respondents from Nankese.

Dog bite information

Only 17.7% (56/316) of respondents had ever been victims of dog bite [Table 4]. Out of that 7.1% (4/56) underwent the appropriate first aid before going to the hospital, while the remainder either did nothing before going [55.4% (31/56)] or went to the hospital after having applied traditional remedy (14.3%). The majority (58.1%) of those who patronised the hospital did so within 0-12 hours of the bite. We enquired from respondents who were never bitten by dogs what their approach would be if they were bitten. Response varied as in table 4. The largest proportion of respondents 81.5% (212/260) said they would go to hospital. Only 12 (4.6%) said they would go to the hospital after the appropriate first aid and 7.3% would visit hospitals after traditional home remedies. Also, 6.2% would take only traditional treatment.

Table 2. Rabies knowledge among respondents in Suhum municipality

	Frequency (*n* = 259)	Percent (%)
What is the local name of rabies?		
Nkraman Yareɛ	37	14.3
I don't know	214	82.6
Other	8	3.1
What mainly transmits rabies to humans?		
Dogs	233	90.0
Juju/Witchcraft	6	2.3
I don't know	15	5.8
Other	5	1.9
How is rabies transmitted from animals to humans?		
Through bites	235	90.7
Through scratches	7	2.7
Licking of wounds	6	2.3
I don't know	18	6.9
Other	14	5.4
Are you able to tell by observing signs whether a dog has rabies?		
Yes	155	59.8
Are you able to tell by observing signs/symptoms whether person has rabies?		
Yes	189	73.0
What is your source of rabies information?		
Neighbours/friends	164	63.3
Media	13	5.0
Animal health officer	3	1.2
School	10	3.9
Health officer	3	1.2
Experience	66	25.5

The most popular traditional intervention among 38 respondents was to chew kola nut (*Garcinia kola*) and apply it to the wound (57.7%). Others (7.9%) said they would visit the blacksmith to get the toxin extracted. Some respondents (5.3%) said they would risk plucking some hair off the offending animal and applying it to the wound. Another 5.3% mentioned that they would apply the herb *Chromolaena odorata* (known locally as Acheampong) and 2.6% mentioned the use of *Ocimum gratisimum* (known locally as nunum). Others mentioned the use of vegetables for treatment – Onion, *Allium cepa* (5.3%) or Okra, *Abelmoschus esculentus* (5.3%)

Dog vaccination information

There was high [83.9% (78/92)] awareness of rabies control through dog vaccination. Dog owners who had vaccinated their dogs against rabies in the past five years were 70.7% (65/92), and only 40% (26/65) had revaccinated their dogs with the least revaccination level (13.3%) recorded in Nankese sub-municipality. The majority [80% (52/65)] of the dog vaccinations happened at the RIWA Ghana campaign site. Children and household heads (fathers) were mostly involved in taking the dogs for vaccination in 44.6% and 40% of households respectively as outlined in Table 5.

The most predominant reasons for not vaccinating or revaccinating a pet were: (1) difficulty in catching or restraining the dog [24.2% (15/62)] and (2) dog owners not appreciating the need for vaccination [24.2% (15/62)]. About 17.7% (11/62) of the dog owners who did not vaccinate nor revaccinate their dogs claimed

Table 3. Respondents' demographic characteristics and rabies awareness in Suhum

	Aware of rabies	Bivariate analysis	
		RR (95%CI)	*P*-value
Age (in completed years)			
Under 20	16/25 (64.0)	1	
20-29	64/87 (73.6)	1.149 (0.835-1.583)	
30-39	60/68 (88.2)	1.379 (1.015-1.873)	0.004
40-49	45/56 (80.4)	1.256 (0.911-1.731)	
50-59	35/38 (92.1)	1.439 (1.057-1.959)	
60+	39/42 (92.9)	1.451 (1.069-1.970)	
Sex			
Male	120/138 (87.0)	1.114 (1.006-1.232)	0.042
Female	139/178 (78.1)	1	
Level of education			
Nil	31/39 (79.5)	1	
Primary	21/32 (65.6)	0.826 (0.613-1.111)	
JHS	113/137 (82.5)	1.038 (0.869-1.239)	0.0405
SHS	59/71 (83.1)	1.045 (0.864-1.265)	
Tertiary	35/37 (94.6)	1.190 (0.997-1.421)	
Sub-municipality			
Suhum Central	106/124 (85.5)	1.210 (1.041-1.406)	
Nankese	65/92 (70.7)	1	0.003
Ayekotse	88/100 (88)	1.246 (1.072 to 1.4475)	

RR: Risk ratio.

they were not aware of any vaccination exercise by RIWA, or the vaccination post distance is long.

Respondents' selected characteristics, awareness, and dog vaccination

As shown in Table 6, significant variation was found between dog vaccination against rabies and rabies awareness ($P = 0.002$), awareness of rabies control through vaccination ($P = 0.000$) and the number of dogs owned ($P = 0.009$). Respondents with rabies knowledge were 2.8 times more likely to vaccinate their dogs, while those with rabies vaccination knowledge were 2.9 times more likely to vaccinate their dogs. Respondents with 1 dog were more likely (1.4 times) to vaccinate their dog than those who reported owning more dogs.

DISCUSSION

This study reports good knowledge of rabies which compares variably to 76.5% in the Upper East Region of Ghana[12] and 49.5% in Debretabor, Ethiopia[13]. This encouraging knowledge of the participants might be due to the level of education of participants, sensitisation activities by voluntary organisations such as RIWA-Ghana and other One Health partners[14]. Although Awuni *et al.* (2019) reported that male dog owners are more likely to have good knowledge of rabies compared to females[12], Palamar *et al.* (2013) reported the contrary[15]. This might be due to cultural practices, where most males dominate and participate in outreach educational durbars and meetings. We did not assess the relationship between sex and education of participants. In developing countries, including Ghana, females are less disproportionally educated than males. Education disparities between males and females may be a contributing factor. Children are targets for rabies education because they have a higher risk of rabies infection. However, adults are more likely to attend education fora than juveniles. Education materials are more likely given to adults in household. Children and women will not read the material even if given. They will normally keep such

Table 4. Information on dog bites, attitudes and practices of victims in Suhum municipality

	Frequency	Percent (%)
Have you ever been bitten by a dog? (*n* = 316)		
Yes	56	17.7
If yes, what steps did you take? (*n* = 56)		
I went to the hospital immediately	31	55.4
I went to the hospital after first aid	10	17.9
I used traditional medicine only	4	7.1
I went to the hospital after traditional medicine	8	14.3
I did nothing	3	5.4
If no, what measures would you take in case of dog bite? (*n* = 260)		
I will go to the hospital immediately	212	90.7
I will go to the hospital after first aid	12	2.7
I will use traditional medicine only	16	2.3
I will go to the hospital after traditional medicine	19	6.9
I will do first aid only	1	5.4
What specific traditional home remedy did/will you use? (*n* = 38)		
Kola nut (*Garcinia kola)*	22	57.9
Human urine	1	2.6
Onion (*Allium cepal*)	2	5.3
Acheampong weed (*Chromolaena odorata*)	2	5.3
Nunum plant (*Ocimun gratisimum*)	1	2.6
Okra (*Abelmoschus esculentus*)	2	5.3
Salt water	1	2.6
Torniquet	2	5.3
Visit the Blacksmith	3	7.9
Dog hair	2	5.3

materials for the landlord/family head, the man

The name *Nkraman yareɛ* (dog disease) given by respondence to mean rabies, reflects the position of rabies as the most talked-about dog disease in the countryand also[16], in the zoonotic sense, the one which most locals can trace to dogs. Even though a misnomer as there are so many dog diseases - zoonotic or otherwise in Ghana, it is affirmed by the Twi Medical Glossary published through the Medical Education Partnership Initiative, Kwame Nkrumah University of Science and Technology (MEPI-KNUST). "*Nkraman Abɔdam*" literally means *dogs madness* - which better describes rabies - formed only a few responses.

Unlike in the Western Region of Ghana, where schools and mass media are the predominant sources of rabies information[8], a majority of respondents in this study traced their rabies knowledge to family, neighbours, and friends, and a similar pattern was observed in Tanzania[17]. This study found significant differences between the level of rabies knowledge and the source of rabies information. All of the respondents who learned about rabies from veterinary or medical officials had good knowledge of rabies. Medical and veterinary professionals through education and practice are more knowledgeable on the subject than the average citizen. They are, therefore, the most likely to provide authentic rabies information. Despite the perfect output from medical and veterinary sources, the number of respondents who made reference to either of them was very few. Regardless, it is an indication that a combined effort between human and animal health professional can orient society in a more positive direction in terms of rabies control, also reported by Sambo *et al.* (2014) in Tanzania[17].

Table 5. Dog vaccination information and practices

	Frequency	Percent (%)
Are you aware rabies is controlled through vaccination of dogs? (*n* = 92)		
Yes	78	83.9
In the past five years, have any of your dogs been vaccinated against rabies? (*n* = 92)		
Yes	65	70.7
Where was the vaccination first done? (*n* = 65)		
Municipal Veterinary Office	6	9.2
Household	7	10.8
RIWA-GH Campaign site	52	80.0
Which member of your household took the dog for vaccination? (*n* = 65)		
Household head	26	40.0
Spouse	9	13.8
Children	29	44.6
Other	1	1.5
Has it been vaccinated thereafter? (*n* = 65)		
Yes	26	40.0
Why have you not vaccinated/revaccinated your dog(s)? (*n* = 62)		2.6
There is no need	15	24.2
Not aware of vaccination exercise	11	17.7
Difficulty catching or restraining animal	15	24.2
Long distance to the vaccination site	11	17.7
No one was available to take the dog	10	16.1

Table 6. Association between respondents' selected characteristics and dog vaccination

	Vaccinated	Bivariate analysis	
		RR (95% CI)	*P*-value
Do you know the disease called rabies?			
Yes	62/81 (76.5)	2.807 (1.0612-7.4224)	**0.002**
No	3/11 (27.3)	1	
Are you aware that rabies is controlled through the vaccination of dogs?			
Yes	61/77 (79.2)	2.971 (1.2736-6.9296)	**< 0.0001**
No	4/15 (26.7)	1	
Number of dogs owned			
1 dog	36/44 (81.8)	1.354 (1.0358-1.770)	**0.009**
More than 1 dogs	29/48 (60.4)	1	

RR: Risk ratio.

With regards to the mode of transmission of rabies, exposures such as scratches and licks to broken skins which were rarely identified demonstrate limited knowledge of rabies' mode of transmission. This implies that those forms of exposure other than bites are less likely to be taken seriously and may invariably lead to rabies in human victims. This suggests the need for education about rabies in the municipality.

Health seeking behaviour in Tanzania showed that a few dog bite victims would apply the right first aid before going to the hospital whereas 95% would go to the hospital without taking any action[17]. In this study, respondents indicated that they would use traditional remedies before reporting for medical attention. This is worrying and points to the need for more public education on the importance of taking

first aid and seeking immediate health care after a dog bite. Traditional medicine remains enshrined in the African way of life[18]. In Ethiopia, as high as 81% of dog bite victims trust traditional remedies more than the approved postexposure prophylaxis (PEP) after the bite and many would not cross a river because it is associated with the onset and severity of rabies[19]. The most talked about myth in this study was applying kola nut, human urine, hair of the offending dog, and salt to bite wounds to prevent rabies. This practice along with several variations have been observed worldwide[20]. Interestingly, some respondents harbored the belief that blacksmiths possess the power to neutralize the causative agent of the disease, which, to those respondents, was a toxin. From the scientific viewpoint, not only are such practices ridiculous but they present health hazards too. Capturing a suspected rabid animal to pluck its hair, for instance, puts more people at risk of being bitten and contracting rabies. Despite being ineffective, most of these practices are substitutes for proper PEP, and dog bite victims who go through them risk coming down with rabies if the offending dog was rabid. Killing of suspected rabid dog and reporting to animal health officials were the most dominant practices as reported in Tanzania and Ethiopia[17,19]. The vaccination figures in this study compare better to those reported in Kenya[21], Ethiopia[22], and elsewhere in Ghana[8,13]. The high proportion of vaccinated dogs in this study can be traced to the free vaccination campaigns led by RIWA Ghana, considering that the majority of the vaccinations reported by this study happened at a RIWA Ghana campaign site, and only 1.5% of previous vaccinations happened outside the period of the campaign.

Sustained dog immunity is key to interrupting rabies transmission and for rabies elimination. Despite the encouraging vaccination turnout in first vaccinations, only 40% of previously vaccinated dogs had been revaccinated. There were significant differences in revaccination levels among sub-municipalities, with Nankese - the most rural of the three - recording the least (13.3%). Reasons given by dog owners for not vaccinating or revaccinating their pets varied. Difficulty in restraint and transportation of dogs to vaccination sites are predominant excuses given by dog owners for non-participation in dog vaccination exercises[23]. Vaccination cost is also an obstacle to dog vaccination across Ghana, and Africa as a whole[19,13,8]. Responsible dog ownership is important if we are to eliminate rabies by the year 2030. However, much research is required on the use of static vaccination points and other reasons cited here to overcome barriers to rabies control[24].

More than half of the known victims of dog bites in this study were below 15 years, and this agrees with the global trend that rabies cases occur among children under 15 years[3]. Children are less likely to identify warning signs from dogs and can easily fall victim to dog attacks. However, it is enlightening to report that participation of children in vaccination was found to be encouraging. In most households, children were the ones who took the dogs for vaccination. Children are most at risk of rabies and involving them in rabies control efforts will help protect them against the disease and make them more responsible pet owners with rabies eradication at heart.

This study establishes a significant relationship between rabies awareness and dog vaccination which unanimously agrees with findings in Ghana, Tanzania, and elsewhere[12,17,25]. Whereas these studies found the influence of rabies knowledge on dog vaccination significant and stressed the need for public awareness creation, this study reports contrary on awareness. This would not have been the case if as many people who were aware of rabies were as knowledgeable in the subject. Also, the number of dogs in a household was found to significantly hamper dog vaccination efforts, as too many dogs may be difficult to capture and transport to vaccination sites - a predominant excuse for non-vaccination of dogs by respondents.

In conclusion, this study reveals some of the gaps in rabies practices in the Suhum Municipality. The study found that most of the respondents are aware and have good knowledge about rabies. However, their

practices in disease prevention and control were poor.

The findings suggest the need to bridge the rabies awareness and knowledge gaps, transform that awareness into good knowledge, and good knowledge into good practices. Continued and strengthened education through One-Health collaboration of stakeholders and the cooperation of local community will be required for effective rabies control.

Studying in an unplanned developing community was a challenge, especially in providing a sampling frame. The convenient sampling in some of the communities in this study might affect the outcome of this study. The free rabies campaign in the communities prior to this study may have also influenced the findings of vaccinations from this study.

DECLARATIONS

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Authors' contributions

Designed the study: Suu-Ire RD, Sarpong A, Mudoga E, Asumah S, Mudoga E
Conducted research and: Suu-Ire RD, Sarpong A
Wrote the manuscript: Languon S
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Conflicts of interest

All authors declare that there are no conflict of interest.

Ethical approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

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