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# Rabies Virus in Sierra Leone: Challenges and Recommended Solutions for Elimination by 2030

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## Abstract

The objective of this write-up is to find possible solution control canine rabies virus in Sierra Leone and other low-income countries in the world. Rabies is a viral disease affecting both humans and animals in Sierra Leone. The country has no policy on dog ownership and management, two veterinarians, limited access to rabies vaccines and human immunoglobulin, and a lack of information about the disease in the country despite increasing dog bite cases and death. There is no wildlife specialist to initiate wildlife vaccination. Continuous vaccination increased awareness, trained personnel in veterinary and wildlife, development of policies on responsible dog ownership and by-laws and increase financial support from the government and private sector will help Sierra Leone eliminate rabies in the first half of the twenty-first century.

**Keywords:** Rabies, Dog, Vaccination, Eradicate, Virus

## 1. Introduction

Rabies Virus is an acute, progressive, and fatal anthroponozoonotic infection of the central nervous system belonging to the genus lyssavirus and family Rhabdoviridae that causes rabies [1]. History of rabies date back to work done by various contributors, such as Democritus (460–370 BC), Aristotle (384–322 BC), Pliny the Elder (23–79 AD), Galen (130–200 AD), Celsus (25 BC–50 AD), Rufus of Ephesus (80–150 AD), Oribasius (320–400 AD), and Aetius of Amida (502–575 AD) [2]. Records obtained from ancient Mesopotamian civilization approximately 4,000 years old associate rabies to bites by a mad or vicious dog [3, 4]. In the 16th century, Girolamo Fracastoro reported that when an animal bites and break into the skin it introduces the rabies virus [5]. In 1885, Louis Pasteur developed the first successful rabies vaccine [6]. Yet, rabies remains a threat to both humans and dogs in the 21st century [7, 8].

Rabies had been in Sierra Leone since antiquity but was isolated from the brain of the rabid dog at the Teko Central Veterinary Laboratory in Makeni, northern Sierra Leone in 1949 [9]. Rabies also existed in Kenema, Blama, and other parts of the country later found to be endemic with the virus.

Lack of veterinary staff prevented the government from developing policies on dog ownership and management, undertaking large-scale research and awareness-raising on rabies [10] resulting in dogs receiving limited attention from their owners. Some could not feed their dogs, provide treatment nor pay for a rabies vaccine. With this obvious gap, rabies continues to take its toll on both humans and dogs. To combat this menace, the government focused on vaccinating dogs in major cities and outbreak communities providing high-cost rabies vaccines for affluent dog owners, while leaving dogs from low-income earners and the public unvaccinated. Liberia and other parts of sub-Saharan AFRICA reported a similar situation [11].

The death of thirteen people from 1968 to 1973 warranted government to vaccinate 4700 dogs in 1974 [12] which in turn gave prominence to control of rabies through a national vaccination of dogs which was short-lived due to the hosting of the Organization of African Unity (OAU) conference in the 1980s. The Government diverted meager resources to the hosting leaving most government departments unable to discharge their normal duties and service. Funding allocations to government departments dwindled and development in the veterinary sector diminished hence the inability to provide basic veterinary infrastructure and vaccination exercise for dogs and cats. No doubt, the difficulties, and hardship after the hosting of the OAU conference followed by political injustices brought resentment to governmental policies among the population.

Animal welfare occupied a lower primordial position on the list of national priority and family. This is also true across Africa where there is a lack of coordination and collaboration regarding dog ownership management, rabies control, and elimination activities, both within and across countries [12]. Most homes could no longer afford three meals a day and dogs have to cater for their daily survival. People focus their energies on their survival rather than dogs (Suluku et al. 2007). Dogs migrate with their owners during the war, which led to an increase in dog population in the capital city of Freetown and other district headquarter towns [13].

The bloody civil war (1991–2002) which brought untold suffering on the people of Sierra Leone was advantageous to dogs with many migrating to major cities and towns. The migration led to the increased urban population, congestion, and uncoordinated waste disposal in the city, the district headquarters towns, and refugee camps. In neighboring Liberia, the Lancet report 2014 reported a similar situation with a lack of electricity supply in large areas of the country especially after the rebel war from 1989 to 2003 and the devastating Ebola outbreak in 2014–2015. After the war, the crime rate increased and the need for dogs as guard dogs becomes inevitable for most people and families. Stray dogs do find food in garbage dumpsites, which enhanced survival and increased dog population, with a corresponding increase in dog bite cases. There is also no organized network of rabies actors to combat the escalating rabies cases in the country and at the regional level. However, some Africa regional groups such as Pan-African Rabies Control Network (PARACON) were established in 2015 to provide a forum to share information and provide available tools and knowledge to eliminate dog-mediated human rabies in Sub-Saharan Africa by 2030 [14].

## **2. Challenges of canine rabies virus control in Sierra Leone and other developing countries**

### **2.1 Policies**

Policies on dog ownership and management existed during the colonial era but were abandoned after independence. People and their dogs in the past received an annual rabies vaccine. The Government trained and empowered Police officers often called dog police, to impound, and penalized dogs' owners who failed to comply. The license and vaccination of dogs gradually disappear and dog owners no longer vaccinate their dogs against the rabies virus. Compounding the situation further is the complete lack of rabies vaccine in the country in the recent past and the prolonged civil war. Vaccinations of dogs are mostly done on an ad-hoc basis and only a few people especially children vaccinate their dogs. In most countries in Africa, people vaccinate their dogs on World Rabies day. Such spurious vaccination exercise will not eliminate rabies in the continent. The lack of effective policies on how people should own and manage dogs also tends to increase rabies outbreaks in the country. In China, for example, the national policy requires the availability of PPE (Personal protection equipment) in clinics in remote areas. Unfortunately, there was no information regarding the availability of PPE in remote communities in Sierra Leone [15]. Government across the African continent faces many challenges to effectively coordinate multifaceted programs of implementing the animal-human interface in the ecosystem in which they live [16]. The coordination of such structures is lacking in Africa and most countries have little or no public information concerning policies and strategies to eliminate rabies on the continent.

In the past decade, resource-poor countries in Africa are making some progress in rabies control and have increased their efforts due to a shift in policy by the tripartite group comprising FAO, WHO, and OIE to eliminate canine rabies by 2030 in African countries [17]. Despite this shift in policy towards canine rabies elimination, there is little public information concerning policies and strategies addressing canine rabies elimination for the whole continent.

### **2.2 Lack of veterinary personnel**

Sierra Leone has only two veterinary officers employed by the government and three are lecturers at Njala University. The mandate of the Government veterinary doctors relates to the welfare of all animals in the country however, those deployed in the capital city are saddled with the administrative matter. With a higher rate of dog bites often reported every week by WHO, saddled administrative duties prevent them to do a follow-up on people bitten by dogs.

The lack of organized outreach programs by the government veterinary doctors and routine vaccination exercises for dogs make canine rabies control and elimination in Sierra Leone extremely difficult [18, 19]. This problem is not only affecting Sierra Leone but also other countries in sub-Saharan countries such as Angola, Botswana, Cameroon, Ethiopia, Kenya, Nigeria, Namibia, South Africa, Tanzania, Zambia, and Zimbabwe [20] where ethnoveterinary practices are commonly used to control of rabies.

### **2.3 Lack of information on rabies**

The livestock division in the Ministry of Agriculture and Forestry from antiquity lacks veterinary personnel and other support staff to provide adequate information

and services to animals and pets owners in the country. People do not know where to go when bitten by a rabid dog, nor is the vaccine available to treat both dogs and humans. Often human medical personnel refers dog bite victims to the veterinary doctor or clinics which implied that the knowledge of rabies and its treatment plan is low among medical personnel, especially in rural communities. The perception of the disease among the people is also poor as death associated with rabies is often attributed to witchcraft. Many countries in Africa have in one way or the other established a network to control rabies (40/54) however, there is still a lack of epidemiology data on rabies control and prevention [21] in both humans and other domestic animals [22]. In a review of dog control in West and Central Africa, it was reported that half of the countries in the two regions do not have reliable figures on dog population nor reported cases of rabies [23].

This obvious gap necessitates the need for research on the perception and knowledge of rural and urban dwellers on rabies and how best to handle dogs that bite people, this approach will help eradicate the disease in countries where 70% live in rural communities by 2030.

On the provision of vaccines, there is only one veterinary pharmacy located in the capital city of Freetown where animal owners and dog bite victims do patronize for rabies vaccines. To increase awareness of rabies and the need for antirabies vaccination, the Animal Health Club initiated a rabies campaign between 2008 and 2013. With this effort, people became aware of rabies but lack vaccine to initiate large-scale vaccination exercises in the country hamper this laudable move to control the dreaded disease (Unpublished World rabies day report 2013).

## **2.4 Lack of wildlife specialist to engage in wildlife rabies vaccination**

In Sierra Leone, the wildlife department in the Ministry of Agriculture and Forestry is responsible for all wildlife activities in the country. However, there had not been any anti-rabies campaign, especially for wildlife. Since the reservoirs of rabies are wildlife, vaccinating dogs against rabies without vaccinating wildlife is a fruitless endeavor, particularly when over 95% of dogs roam freely. This untamed or stray dog makes rabies eradication in Sierra Leone to be a herculean task to achieve by 2030. Currently, the wildlife unit is not adequately prepared for antirabies vaccination of the wildlife even though Njala university trains and graduates wildlife specialists every year.

## **2.5 Lack of follow-up on dog bite victims**

After the establishment of the National Livestock and Animal Welfare Rabies Control Task Force (NLAWRCT) and the One Health Platform, the World Health Organization and the livestock officers, and community animal Health established animal bites (including dogs) surveillance across the country. WHO reports animal bites in a weekly meeting as shown in tables and figures 3.1, 3.2, and 3.3 respectively. Livestock officers including community animal health workers report to the Epidemiological unit in the ministry of agriculture which also share such information during weekly meetings with development partners but there was no strict follow-up by both partners and the government officers on the rabies status of the dog and the persons bitten by the dogs. The lack of reliable data on death due to rabies to inform government makes it impossible to allocate resources to



rabies control. This pattern is consistent with most African countries where the level of the estimate of rabies burden is grossly lacking and insufficient to warrant investment [24].

### **3. Method to control and eliminate canine rabies by 2030**

#### **3.1 Formulation of by-laws**

Since By-laws are rules or laws established by an organization or community to regulate itself, hence authorities and community members may establish and enforced by-laws to own and manage dogs [25]. Such acts and regulations should be enforced by the state veterinary services, and statutory animal welfare standing advisory committee should be in place to advise the government. These Established by-laws will help reduce rabies in communities, as was the case in the city of Craig in 1965.

In Sierra Leone, the Animal Health Club encouraged Villages around Njala University to formulate animal rearing by-laws. The club trained the villagers to wash and fed their dogs, the Animal Health Club provided groundnuts, seed rice, and cassava as an incentive for the children to care for their dogs in 2010. With this approach, communities have not reported any rabies incidents (Animal Health Club unpublished report 2010).

#### **3.2 Responsible dog ownership**

The concept of responsible dog ownership is a multifaceted social phenomenon intended to shape daily animal-human interaction [26]. Animals are increasingly becoming integrated into the human family in such a way that necessitates increasing attention and control [27]. It is therefore the moral responsibility of the owner to train the dogs in such a way that it conforms to the dictates of society. Dog owners are often to blame for the behavior of their dogs [28]. By providing sleeping places for dogs, feeding them at the appropriate time, providing water and treatment do make dogs behave responsibly, and reduce the chances of contracting rabies. Where such care is not in place, such dogs do scavenge for food in the nearest garbage, dumpsites, and neighborhoods. Such dogs around garbage dumpsites are often termed stray dogs, but most often are owned but unsupervised. Stray or unsupervised dogs often contract rabies through exposure to rabies virus from other street dogs and wildlife, which are a reservoir of rabies.

#### **3.3 Continuous vaccination of both domestic and wildlife animals**

Human beings have striven to eradicate pathogens of public health importance. Routine vaccination of diseases such as measles, polio, and diarrhea has saved over 10 million lives between 2010 and 2015 [29]. Successes of these magnitudes have convinced the World Health Organization (WHO), World Organization for Animal Health (OIE), the Food and Agricultural Organization (FAO) of the United Nations, and the Global Alliance for Rabies Control (GARC) to plan Canine rabies elimination by 2030. Their main elimination strategy is the continuous vaccination of both domestic dogs and wildlife animals. Domestic dogs present the greatest threat to public health particularly in poor countries where

dog ownership and management policies are weak or non-existence such as Sierra Leone [30, 31].

Developed nations have successfully eliminated canine rabies through continuous vaccination of domestic dogs and wildlife, good dog ownership, and management followed by strongly enforced welfare policies [32].

In low-income countries including Sierra Leone, continuous vaccination of domestic dogs alone will not eliminate canine rabies because large-scale, dog vaccination campaigns should include vaccination of wildlife host species to effectively control or eliminate dog rabies [33]. Such a rabies vaccination campaign should utilize the One Health Approach to raise awareness. It should also be backed with strong bylaws, or animal welfare policies, effective dog population management, and strong political backing to eliminate canine rabies by 2030.

### **3.4 Training of canine and wildlife specialist in third-world countries**

The reservoir of the rabies virus is mostly wildlife animals, but that which helps to transfer rabies to humans is a dog, ‘man’s best friend’ Developing countries or low-income countries lack specialists in the area of canine and wildlife practice. In Sierra Leone and by extension West Africa need to train canine and wildlife specialists with a focus on rabies and other zoonotic disease control.

### **3.5 Development of the seven freedoms of animal welfare for developing countries**

The five freedom of animal welfare originated from intensively kept animals often referred to as the golden standard developed by Professor Brambell and his team [34]. These five freedoms include Freedom from hunger and thirst, freedom from discomfort, freedom from pain, injury, and disease, Freedom to express normal and natural behavior, and Freedom from fear and distress. High-income countries like the United States of America, Europe, and South America have used this to eradicate and control the rabies virus.

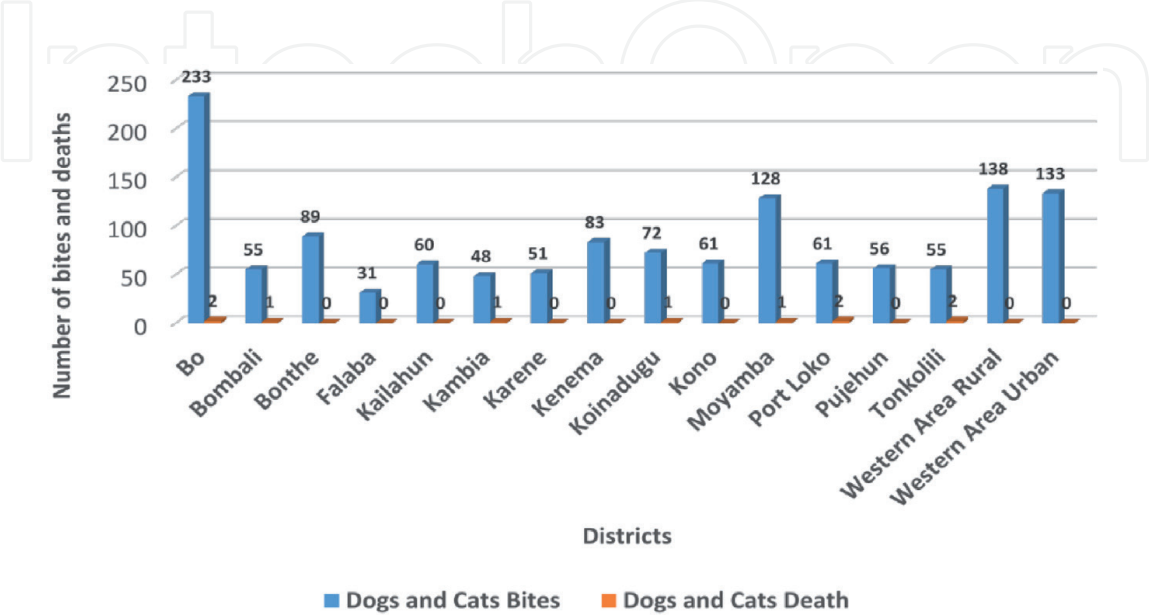
The five freedoms do not apply to low-income countries where dogs scavenge in garbage dumpsites, feed through the hunting of rodents and wildlife animals they often roaming freely in the neighborhood and bushes during hunting.

Continuous vaccination of these dogs will not prevent rabies as they continuously interact with wildlife hence the need to complement the seven freedoms of animal welfare in low-income countries including Sierra Leone.

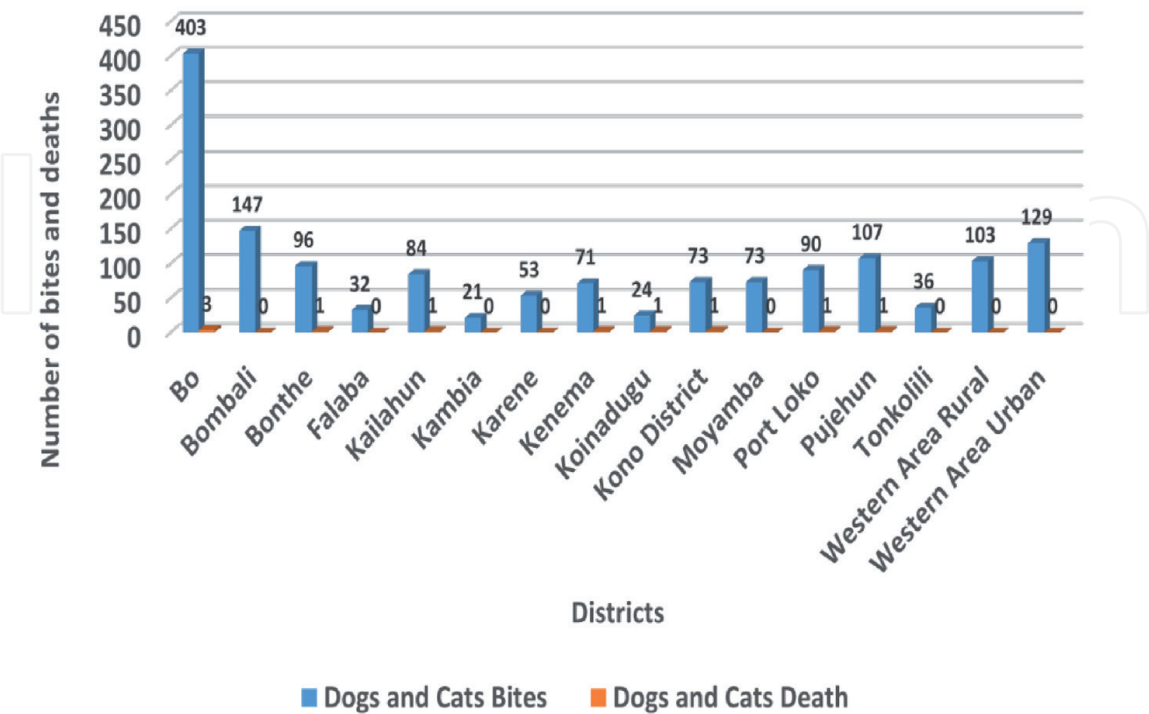
## **4. Tables and figures**

The above data shows the number of and cats dog, cats bite cases, and people who have died of dogs and Cat bite cases in Sierra Leone from 2018 to 2020. The number of dog bite cases in 2018 was 1,354 cases resulting in 10 deaths while in 2019, the number of bite cases increased to 1, 544, but the number of death remains the same at 10. In 2020, 1,301 dog bites cases was resulting in 6 death. A personal interview with the Laboratory personnel of the National Central Veterinary Laboratory in Makeni reported that out of 10 dog bite cases reported

about 90% are positive for rabies. Thus indicating the presence of rabies in the country. Out of 270 blood samples collected from dogs in the north, south, and east of the country, 24% show positive rabies antibodies in unvaccinated dogs (Unpublished PhD thesis, 2020). Sierra Leone is therefore far from rabies control if the above solutions are not properly taken into consideration (Figures 1–3 and Tables 1–3).

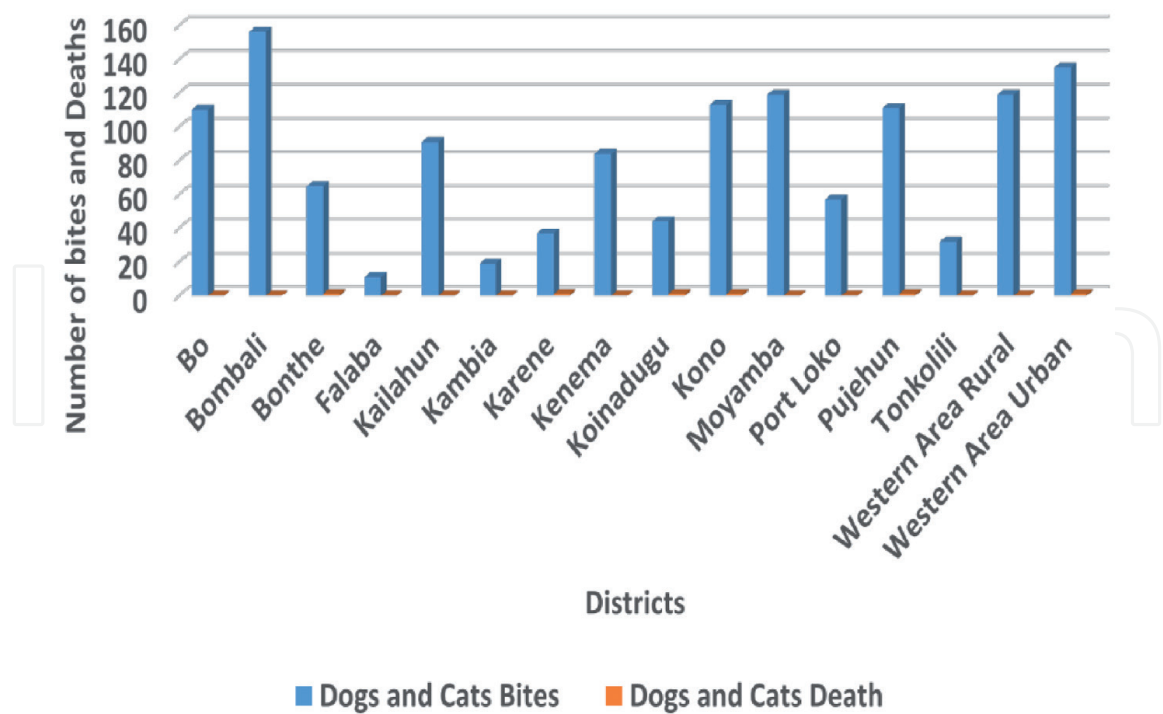


**Figure 1.**  
*Graph showing dogs, cats bites and deaths 2018.*



**Figure 2.**  
*Graph showing dogs, cats bites and deaths 2018.*





**Figure 3.**  
Graph showing dogs, cats bites and deaths 2018.

Dog, Cats bites and Death 2018		
District	Dogs and Cats Bites	Dogs and Cats Death
Bo	233	2
Bombali	55	1
Bonthe	89	0
Bo	233	0
Bombali	55	1
Bonthe	89	0
Fallaba	31	0
Kailahun	60	0
Kambia	48	1
Kerena	51	0
Kenema	83	0
Koinadugu	72	1
Kono	61	0
Moyamba	128	1
Port Loko	61	2
Pujehun	56	0
Tonkolili	55	2
Western Area Rural	138	0
Western Area Rural	133	0

Source: Ministry of Health and Sanitation 2021.

**Table 1.**  
Dog and cat bites and deaths 2018.

Dog, Cats bites and Death 2019		
District	Dogs and Cats Bites	Dogs and Cats Death
Bo	403	3
Bombali	147	0
Bonthe	98	1
Fallaba	32	0
Kailahun	84	1
Kambia	21	0
Kerena	53	0
Kenema	71	1
Koinadugu	24	1
Kono	73	1
Moyamba	73	0
Port Loko	90	1
Pujehun	107	1
Tonkolili	36	0
Western Area Rural	103	0
Western Area Urban	129	0

Source: Ministry of Health and Sanitation 2021.

**Table 2.**  
*Dog and cat bites and deaths 2019.*

Dog, Cats bites and Death 2020		
District	Dogs and Cats Bites	Dogs and Cats Death
Bo	110	0
Bombali	156	0
Bonthe	65	1
Fallaba	11	0
Kailahun	91	0
Kambia	19	0
Kerena	37	1
Kenema	84	0
Koinadugu	44	1
Kono	113	1
Moyamba	119	0
Port Loko	57	0
Pujehun	111	1
Tonkolili	32	0
Western Area Rural	119	0
Western Area Urban	135	1

Source: Ministry of Health and Sanitation 2021.

**Table 3.**  
*Dog and cat bites and deaths 2020.*

## **5. Recommendations for the control of canine rabies in Sierra Leone**

Rabies virus control in Sierra Leone and other developing countries requires awareness-raising using the Animal Health Club, One Health Strategy, vaccination of dogs (roaming and owned) and wildlife animals, formulation of by-laws for owning and managing dogs followed by the development of seven freedoms of animal welfare for developing countries.

- a. Raise awareness using the Animal Health Club Strategy. Animal Health Club is an organization established to care for the health and well-being of both humans and animals (domestic and wildlife) living in a healthy environment. This club helps to raise awareness on diseases affecting both animals and humans using the One Health Approach [35]. In the case of the rabies virus, the club will work with the country's governance structure to raise awareness on the disease at the national, district, chiefdom, section, and town or village level. At National, the club contacts the appropriate ministries involved in rabies control, which include the Ministry of Agriculture, Health and Sanitation and Environment. Other Ministries include Education, Internal affairs, and Trade while the club will interact with Market women, traders, drivers, bike riders, Local artists, Paramount Chiefs, Town chiefs, and community elders (AHC Unpublished Report, 2012) to implement its activities on rabies and other zoonotic diseases.

At the district level, the club work with Directors, of the respective ministries to identify stakeholders involved in rabies and engages them in raising awareness on the disease at the district level. These involved District Medical officers, Agricultural Officers, Livestock officers, Health Education officers, environmental officers, Police Local Unit Commander and Military officers, Districts council officers, Mayors of cities. Principals and Head Teachers of secondary and primary schools, University lecturers and students, Local artists, Drivers' union, bike riders (often called OKADA), Petty traders, market women, and village town criers. Quiz, Drama, and debate competitions should be organized in schools, while local artists compose songs and act plays in their local dialects and 'Okada' or motorcycle riders drop rabies flyers, leaflets, and blow their horns to draw the attention of the public.

The club uses these and other media to raise awareness and sensitize people on rabies. Other media include Radio discussion and Phone-In programs, Jingles, distribution of flyers, handbills, and posters, composing songs in local dialects. Important personalities in the communities will commence the vaccination exercise as a show of commitment by the government, and other dignitaries in society.

- b. Formulate dog ownership and management by-laws. The Animal Health Club engages the community, towns, or villages in a focus group discussion to understand challenges and constraints in owning and managing dogs, the consequences of rabies on dogs, people, and the community. Animal Health Club members help to edit the by-laws in simple English and read to the entire community, town, or village. Accepted by-laws are reprinted and distributed in Churches, mosques, schools and read to the audience. If the authorities did not receive any complaint, the by-law becomes binding. This approach was adopted in Njala University and surrounding communities to control rabies.

c. Conduct regular vaccinations of owned and unsupervised dogs. Such regular vaccination will drastically eliminate canine rabies in the community. Although sylvatic rabies exists in Sierra Leone, the continuous vaccination exercise in developing countries will contain the virus to a low ebb in low-income countries such as Sierra Leone. Vaccination of over 70% of dogs confers immunity against rabies in a community [36]. This statement holds for communities where they vaccinate both roaming and owned dogs and responsible pet ownership is strongly observed. However, if these dogs interact with animals in the wild, they are likely to contract rabies. These explain why rabies had not been successfully controlling or eliminate in these communities.

d. Established rehoming centers for unowned/unsupervised dogs.

In Sierra Leone, most people in rural communities do exchange items such as rice, chicken, ducks, and farm labor to obtain a dog. To reduce the stray dog population, there is a need to establish a rehoming center that will help to redistribute captured stray and unsupervised healthy dogs to communities and homes that desire to care for dogs. In this center, stray dogs that are terminally ill can be euthanized while healthy stray dogs can be treated, fed, and distributed to communities or people that desire to own dogs. Rehoming is a good strategy to control the stray dog population and reduce canine rabies infection. Sierra Leone has not established rehoming center, but plans are underway to establish such by the one-health platform. The rehoming centers also train new dog owners on how to cater to dogs.

e. Training of para vets or veterinarians to provide services to dog owners in countries where such personnel and veterinary services are limited such as Liberia, Sierra Leone, and The Gambia.

## 6. Conclusion

Rabies disease elimination requires concerted effort to control especially in low-income countries. The efforts should include the availability of the antirabies vaccine, sound policies on rabies virus control, a sufficient number of veterinary personnel, wildlife specialists, and adequate information on rabies with follow-up on dog bites. Adopting the Animal health club model, Formulation of animal rearing by-laws, enforcing responsible dog ownership, continuous vaccination of stray and owned dogs and wildlife animals, training of wildlife specialists and veterinarians with the development of the seven freedoms of animal welfare will help eradicate canine rabies virus in low-income countries including Sierra Leone before 2030.

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## **Conflict of interest**

The authors declare no conflict of interest

## **Research interest**

Control of Zoonotic disease in rural communities through awareness-raising using the One Health Approach.

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