

POST-WAR DEMOGRAPHIC AND ECOLOGICAL SURVEY OF DOG POPULATIONS AND THEIR HUMAN RELATIONSHIPS IN SIERRA LEONE. (A CASE STUDY OF URBAN FREETOWN)

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ABSTRACT

This research conducted on 900 dog-owning households randomly selected in urban Freetown investigated dog population and ecology, and how they relate with human populations, with regards to rabies. Pre-tested questionnaires designed according to World Health Organization standards were administered from Allen town in the east to Juba hills in the west. Area measurements using prescribed methods were done in the east, central and west of Freetown. Dog population was obtained by counting the number of dogs in the three clusters. Results obtained revealed an estimated total dog population of 13,246 with a ratio of 1:14 dogs to humans respectively. Life expectancy of dogs was 3-4 years, although some lived up to 7 years and above. More males were involved in dog rearing than females. Although 72% of dog owners are skilled income earners, however, 81% do not feed their dogs with canned food; hence 88% don't know the cost of feeding their dogs. Approximately, 44% of households allow their dogs to scavenge garbage dumps and to mix with other dogs. Most dogs (77%) are owned by parents, mainly for security purposes, but 59% do not monitor or register their dogs with veterinary clinics and the Ministry of Health and Sanitation. Lack of care and attention accounted for 78% of dog mortality; hence dog owners need to pay closer attention in the management of their dogs to reduce the incidence of dog bites and rabies for a healthy co-existence with them.

KEYWORD: Dog, Survey, Questionnaire

INTRODUCTION

The relationship between man and dog *Canis lupus familiaris* is multi-faceted dating as far back as 13000 years before the birth of Christ (Morey and Darcy, 2006). Originally, dogs provided food and companionship, and later, dogs assisted with other human activities including hunting, herding and transportation. As stated by Boris .M. Levinson, (1969a), humans initially domesticated the dog to meet their own psychological needs, assist in Labour and also provide food. Throughout history, the bond established between humans and dogs has elevated their position and contribution to society to include more service oriented functions including assisting the deaf and blind, detective work, search and rescue work (at sea and land), therapy dogs, war dogs and livestock guarding. Humans have manipulated the breeding lines of dogs for centuries to establish specific colors, sizes, and personality traits that have utilized for sporting events and exhibitions to demonstrate proficiency in agility, racing, and sledding. Domestic dogs have followed and continue to

follow the migration of man and can be found in nearly every part of the world where human beings live. The purpose of keeping dogs varies within and across individual communities and can include companionship, transportation, security, food acquisition and religious beliefs (Hart La, 1995a). Man in turn provides protection, companionship and accommodation and a regular source of food for dogs. These mutual benefits have built a trusting relationship throughout history between dogs and people and ultimately have made life easier for both. (McGourty, 2002). In Sierra Leone, where 63% of the human population (National Statistics Sierra Leone, 2006) lives in rural areas, the major activity is subsistence farming. Here, dogs are used mainly for hunting. In urban areas of the country, dogs are mainly kept for guarding property. A few people in both rural and urban communities keep dogs for both companionship and as pets. Hunting dogs are used to deter pests from destroying crops, and acquiring bush meat for human consumption. Although many societies derive significant benefits from their associations with dogs, dogs can also pose significant public health risk to humans (Talan DA et al, 1999; Wandeler AI, Bingham J, 2000; Weiss HB 1998). The transmission of rabies virus from dogs to humans undoubtedly carries the most serious threat and severe consequences. Dogs are the most important reservoirs of rabies virus in many parts of the world, particularly in Africa south of the Sahara. No diagnostic or laboratory confirmation of rabies has been conducted in Sierra Leone after 1974, due to a lack of the necessary infrastructure. In many parts of the world, owned and unsupervised dogs have easy access to contaminated waste, which is fed to them by their owners, or which they find around slaughter houses or butcher markets. This free range scavenging exposes dogs to disease and they can become infected with parasites, such as *Echinococcus granulose*, and subsequently expose people to cystic echinococcosis (Ouhelli et al, 1997). As in other animals, dogs harbour a great variety of macro parasites, microorganisms and viruses. A large proportion of these infectious agents that are disseminated among, and carried by dogs, are also harmful to man. Daily interactions between unsupervised dogs, either during mating, casual interaction or playing, provide opportunities for rabies virus and other pathogens

to be transferred to man and other animals (Wandeler et al, 1993). During the eleven year old civil war (1991-2002) in Sierra Leone, a large proportion of the human population was internally displaced. Whitfield J, (2003) confirmed that the war displaced nearly half of the population. Many people moved from rural areas to Freetown, increasing the population from one million (1,000,000) to two million five hundred thousand (2,500,000). This led to high incidence of crime in the city compelling most residents to buy and rear dogs for security purposes. Koroma A.M, (2009) reported that analysis of police statistics between 1998 and 2006 showed a clear increase in the crime rate in Sierra Leone, with the western area, (Freetown), recording the highest number of incidents (32,305), compared to the Eastern (7,182), Northern (9,503) and Southern (4,019) provinces. This number dropped slightly in 2001 for the western area to 31,009. The overall effect of the increased crime rate and war was a net increase in human and dog population in urban Freetown that ultimately resulted in an increase in the number of garbage dumps, displaced human population and refugee camps in and around Freetown. The expanding garbage dumps, dilapidated and burned houses, and broken vehicles, became an ideal resting places for unsupervised dogs to reproduce and multiply, which acted as an incentive for owned dogs to join them. Weak implementation of government policy and little concern for dogs enabled them to establish their own territory where they lived freely among the human population. The evidence indicates that the relationship between man and dog, particularly in the capital, requires an in depth study, to examine the increasing dog population. The practical importance of collecting data on dog populations is a prerequisite for developing a strategy for animal disease control and vaccination campaigns and for ecological and epidemiological studies that could be replicated in other parts of the country. The objective of this research was to establish baseline demographic and ecological data of the dog population in Urban Freetown for use by public health and veterinary officers in planning rabies control programs, and to improve the relationship between man and dogs in Freetown, and the country as a whole. Further studies will be conducted in other regions to compare the results obtained.

MATERIALS AND METHODS

STUDY AREA IN URBAN FREETOWN

The survey was conducted in the Urban District of the Western area of Freetown in Sierra Leone, starting from Allen town in the east to Juba hills in the west. Because they are the politically demarcated boundary between the urban and rural district of Freetown, the study area was chosen because of the high number of reported cases of dog bites in police stations and treatment centers at veterinary clinics from these areas (personal interview). The western area is divided into two districts; (urban and rural) and the survey was conducted in the Greater District known as Urban Freetown. The sample area (82 km²), with a population of 746,000 people, was divided into three clusters (East =449,479, West =245,749 and Central=69,256) based on the 2004 population census conducted by National Central Statistics of Sierra Leone. A total of 900 households, 300 from each cluster owning dogs, were randomly selected. A

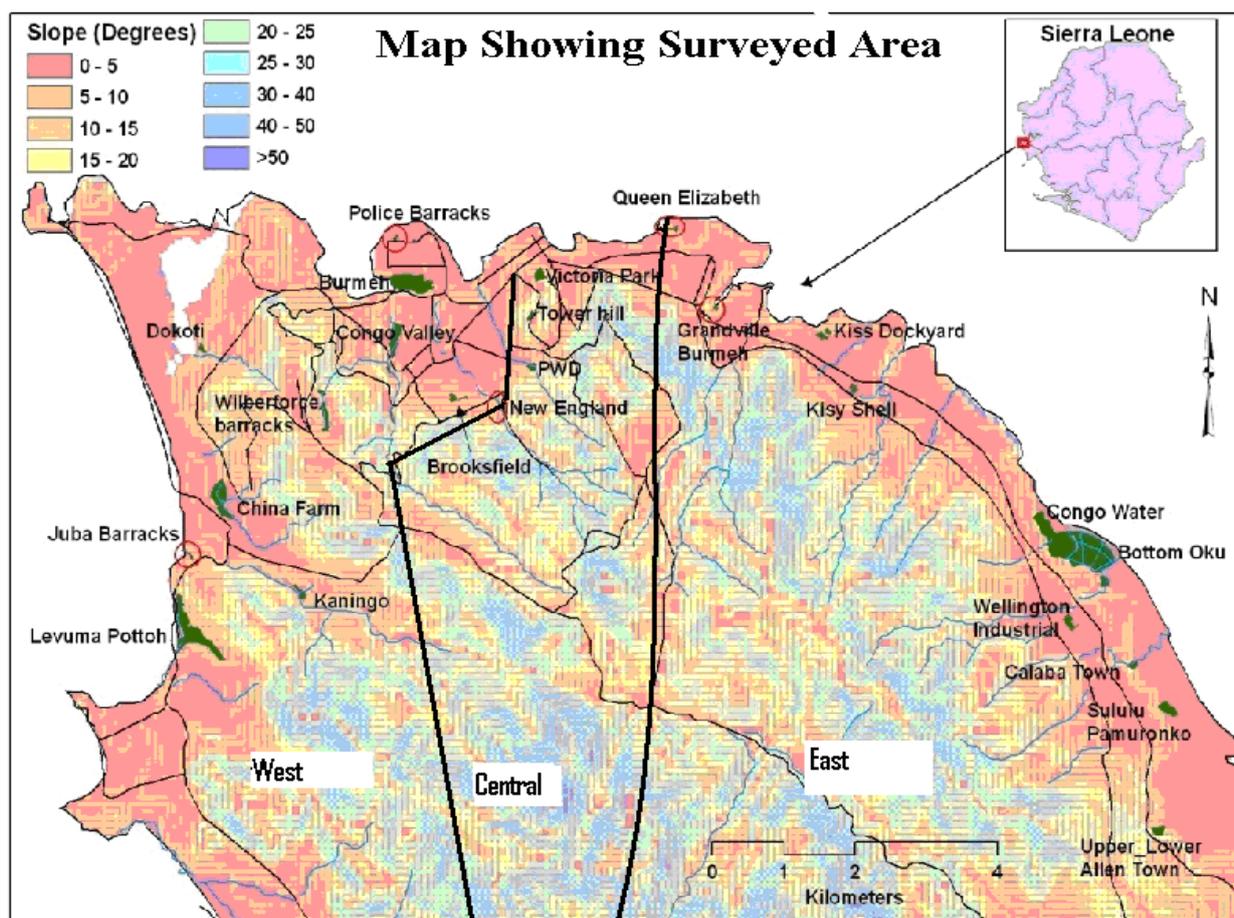
short structured questionnaire, according to World Health Organization standards (WHO, 1999) were administered to every fifth house on a street within each cluster. If no dogs were found in that house or compound, the next fifth house was selected until all houses on the street are exhausted. These questions were pre-tested and found to be appropriate for the survey. Three separate areas within each cluster were selected and the number of dogs counted. The number of dogs counted and the area measured was used to estimate the number of dogs per sampled area. The figures obtained were projected against the actual population of sampled area to provide an estimate of the total number of dogs in the study area. Area measurement was accomplished using metric measuring tape, a ranging pole, and pegs. The average measured area was 0.13 km². The human population in the measured area was confirmed by counting the number of persons present in the house hold or compound. The human population obtained in the measured area in each cluster was added and divided by the number of clusters to obtain the average human population in the measured area. The number of dogs in the measured area was also divided by three to obtain an average number of dogs in the sampled area. The average number of people divided by the average number of dogs gave an estimate of the ratio of dogs to humans in measured areas. Human density in sampled areas was obtained from (82 km²) estimated on a scale of 1:125,000 km maps and the aggregate population was obtained from the 2004 Sierra Leone National Population Census. The data collected were analyzed using the Statistics Package for Social Scientist (SPSS). These were then presented in the form of tables, to enhance explanation of results.

QUESTIONNAIRE SURVEY

The World Health Organizations standard was used as the basis for designing the rabies questionnaire for the household survey (WHO/WSPA1990). Respondents owning dogs were asked their names, age, sex and religion; their occupations and salary range. Households without dogs were not interviewed. All households interviewed were asked the names of the areas where they lived, number of years spent in locality, number of dependants and dogs owned. The 900 questionnaires administered were retrieved after the survey was conducted and were subsequently analyzed.

DOG MANAGEMENT PRACTICES

House hold information on dog habitats included: food, water and shelter, and dog management practices. House hold families owning dogs were asked if they fed their dogs, types of food given to the dogs and frequency of feeding. Respondents were also asked if dogs were fed from the family meal or dependent on it, and the presence of garbage dumps in the area. All respondents were asked about the methods they used to feed their dogs, and if their dogs had access to garbage dumps in and out of their compounds, and if dog owners used special feeding/eating plates. Households owning dogs were asked if they provided water for their animals on a daily basis, the type of water provided, if this water was provided in a drinking trough, and if they had streams or rivers in their vicinity. Respondents were also asked about the places where dogs are housed or slept,



and if they provided sleeping places or shelter for their dogs. All were asked about the presence of unfinished houses and abandoned vehicles in the area. Surveyors were given 10 questionnaires each to administer to ten dog-owning family household in each section.

INDIVIDUAL DOG DATA

Dog-owning house hold families were asked which member of the family owned the dogs, the major purpose of rearing the dogs, if they were confined or fenced, how dogs were kept and how many puppies were produced per year, and the number of survivals and deaths per year. Additional information included the reproductive performance of female dogs, and the ratio of male to females dogs. House hold families were asked about the ages of their dogs, the age of the oldest dog, how the families disposed of their waste, and the type of toilet used by the family. Families were also asked if they would like to own more dogs?, and if they had observed unsupervised/un owned dogs in their communities.

DOG HEALTH AND MORTALITY DATA

Dog owning households were asked if dogs were registered, by what organization, if the dogs taken for treatment, and where they were treated. Dog owners were queried about

rabies in their compound or surrounding areas. Respondents were also asked about the causes of death, if signs before death were similar to those of rabies, and how many dogs have died of rabies. All were asked about the age that recorded the highest mortality.

DOG HUMAN RELATIONSHIP

Dog human relationship data were collected from respondents in all of the clusters. Respondents were asked if their dogs were restricted or confined, the number of dogs in the family, compound and per house hold, average life expectancy of dogs reared, average age range in the population, and number of births per year per female. House hold families were also asked about the ratio of male to female per birth, estimated human and dog population, the number of dogs in the neighborhood and percentage of dogs owned.

RESULTS

Table 1 represents the social economic data of respondents. A total of 900 dog owning households were interviewed between the 2nd -4th June, 2008, of which 512(57%) were males and 388(35%) female. Within these dog owning families, 583(65%) were Christians and 317(35%) Muslims. This figure is contrary to the Sierra Leone Muslim

Atlas 2004, which show that about 75% of the population are Muslim and nearly 25% are Christians. A breakdown of dog ownership in the study area shows revealed that 46% of households owned one dog, 29% owned two dogs, 16% owned four dogs and 9% owned six dogs and above.

The ecology and habitat of dogs refers to the basic facilities dog owners provide for their animals, such as food, water and shelter. This is represented in Table 2. Seventy-four percent of the respondents (692) reported that they fed their dogs with kitchen left overs or household refuse, and allow them to feed on garbage. The majority of people had a source of income, but this is not reflected in their expenditure on feeding dogs. The majority of dog owners 88 % (796) do not know how much they spend on their dogs per week, 7% spend US\$3.0 a week and 3% spend US\$6.0. Data regarding the methods of feeding dogs reveal that 626(70%) partly feed their dogs whilst 17% of dogs in turn complements the effort of their owner by scavenging. Only 121(13%) fed their dogs daily in confinement, and of these, 579(64%) placed the food in plates and 321 (36%) do not. During feeding, 69% provide tap water and 31% of dogs find a source of water for themselves. The majority of people(66%) provide shelter for their dogs. However, one third of dog owners do not provide shelter 34 % (307). The type of shelter provided include kennels 12 % (109) but some of these dogs sleep on the streets in front of their compound 18%(166), whilst the rest co-habit with their owners 625(69%).

In this study, 77% of dogs are owned by parents (father 420 and mother 275) and 17% by children. Dogs were owned mainly for security purposes 81% (731), which explains why a large percentage of the dogs were owned by parents and only few as pets for children. A small percentage claimed to use dogs as food (0.4%). Most of these dogs spend part of their time scavenging in garbage dumps and back yard for food, and return later after scavenging on these sites, whilst the others stay permanently on their own around these sites. Most people use dust bins to dispose of household refuse 53 % (476), whilst 14 % (125) throw house hold refuse directly into garbage dump, but 25 % (221) use plastic bags. Most interviewed stated that they see stray dogs in their communities represented by 630(70%), as seen in Table 3.

Table 4 shows the canine and human relationship. Most residents in urban Freetown do not register their dogs 547(61%). People who have registered their dogs are those who received free rabies vaccination from SLAWS, represented by 55 % (494). Most people refuse to take their dogs for rabies vaccination 45% (406). The non-compliance of people to vaccinate their dogs is due to their lack of knowledge about rabies, 74 % (662), whilst those who know about it represent 26%(238). The life expectancy of dogs in study area varies from one to three years 40.0%(360). On average they can live for between four to seven years and above 44% (398). Most of the dogs were between the age of four to six 45%(402), and one to three years 33%(298)

DISCUSSION

After the cessation of hostilities, many people returned with few dogs, whilst others left their dogs behind with no one to care for them. These categories of dogs, combined with unsupervised dogs, led to an increase in dog populations in Freetown. Similar increases in dog population also occurred during the gulf war in Israel, when in January 1991, residents of metropolitan Tel Aviv area evacuated their home and abandoned their pets (Shimshony. A 1997). With decrease in human population and reduction in the number of garbage sites, ownerless and unsupervised dogs now had limited feeding areas, and were forced to move from house to house in search of food. They consume all available food that they come in contact with. Children are the most vulnerable category of people who easily predispose themselves to diseases transmitted by dogs. In some instances, these dogs eat with children from the same basin or lick their hands, wounds and mouth, thus increasing the possibility to contract the rabies virus. Children are thus at high risk to contract rabies and are serious victims of dog bite in Tanzania (Knobel et al 2005) and America (Overall 1998). Most of the respondents who rear dogs are between the age ranges of 1-64 years, representing the active population. It was however shown that the old (mature) people owned and rear more dogs (45.2%) than their children (43.8%). This is probably attributed to the fact that most parents rear dogs mainly for security reason, particularly so during the war. The low percentage of children involved in dog rearing is probably because most parents or homes do not rear dogs as pets. Active old people above 65 years also rear dogs maybe for companionship. It was also observed that men (56.9%) were more involved in dog rearing than their female (43.1%) counterparts. Men being the head of most household could be responsible for this. Aside from this, studies have revealed an association between adult gender composition of household and dog ownership. For example, in Kuwait, males were reported of having positive attitude towards dogs than females (Al-Fayez et al. 2003) whereas, for the semi rural communities in United Kingdom (Westgarth C et al.2007) and several North American and European countries (Bagley DK and Gonsman VL 2005), adult females were more associated with dog ownership. Although about 70% of the population in Sierra Leone are muslims, this was however, not reflected in the survey conducted where 64.8% of respondents were Christians and 35.2% were Muslims. Most Muslims interviewed indicated that they do not raise dogs because they are filthy and impure while others indicated that dogs shed their hair on praying mats hence, making their prayers invalid. Some however, maintained that they rear dogs due to security reasons. Religious beliefs about not wanting dogs are no longer effective in pastoral settlements, where livestock ownership encourages people to own more dogs (Foltz RC 2005). Owning dogs is not a major religious issue in Sierra Leone. Like many other countries in the world, such as Zimbabwe, there is religious tolerance regarding dog

ownership The majority of the people interviewed was skilled (71.7%) and are engaged in income generation activities whereas 13% are unskilled, and 15.4% are traders. This indicates that most dog owners have a source of income and have the capacity to feed their animals this is not however, reflected in the management of dogs as most people hardly budget for their animals and no special diet is provided for them. A number of American studies have shown relationship between dog ownership and household income (Wise and Kushman 1984). The majority (43.0%) of the people had dependants between the age range 1-9 years (37.6%). This shows that there is a high dependency rate, which explains why some families budget little money for their dogs. The majority of respondents interviewed (80.9%) do not feed their dogs with canned food, which explain the status, type of relationship and care people in Freetown gives to dogs. Although the settlement of people in the city is most often based on social status, this was not shown by the people who feed their dogs with canned food. It was further revealed that most of the respondents use alternative sources of food (74.3%) to feed their dogs, while only (17.7%) feed their dogs with rice. This is due to the high increase in cost of rice which most people at the time of interview were not able to buy and feed their families. Most people (88.4%) were not able to accurately calculate the cost of feeding their dogs per week and only (6.9%) says they spend US\$3.00 per week. It can be seen that majority of respondent, spent little or almost nothing on their animals. This further explains that dog management such as feeding is not a priority to most families which has led to large numbers of strayed and unsupervised dogs roaming the streets of Freetown. Garbage dumps were present in some communities (43.3%) which probably explain why some families pay less attention to feeding their dogs. The presence of garbage dumps in some of these communities, relief some families the burden of regularly feeding their dogs. This survey revealed that 42.9% of families gave free access to their dogs to feed on garbage dumps, whilst others could not. In Freetown, 17% of respondents who own dogs manage them on free range basis. These categories of people do not feed their animals. The animals feed on garbage dumps and faeces. Butler (1998) reported that 53.3% of house hold in rural Zimbabwe who do not have toilet, use the surroundings, thereby provide human faeces as food for dogs. Others 69% subject their dogs to semi-intensive management systems; partly feeding their dogs and the dogs find additional food from the surroundings. Semi intensive system of feeding has led to high number of street dogs in the city as most people using this system, often abandon their dogs and give little or no attention, thus causing the dogs to remain permanently in the surrounding garbage dumps. This type of behavior of unsupervised dogs is common in sub Saharan African countries like Kenya (Kitala et al. 1993a), Zambia (de Balogh et al. 1993a) and Tanzania (Clever land and Dye 1995a). Tap water is distributed throughout Freetown and has been a major source of drinking water (68.8%) for all dogs. Most of the pipes connecting houses are old and dilapidated with many holes. These leaking pipes serve as a source of drinking water (21.1%) for dogs. Drainages and potholes also serve as an alternative source (16.1%) to the others and stream (4.0%). Availability of drinking water becomes a major

problem during the dry season due to lack of rainfall and decrease in the volume of water at Gumadam that supply Freetown. Survey results revealed that 69.4% of respondents co-habit with their dogs in their houses or within their compounds. Other category of respondents (17.1%) allows their dogs to sleep outside their houses or compounds. These are mainly for security reasons and 34.1% dog owners do not know where their dogs sleep. Dog guarding is common in sub Saharan Africa, for example 45% of people in urban Nigeria keep dogs for guarding (Oboegbulem and Nwakonobi 1989), 70% in Zimbabwe (Brooks 1990) and in pastoral communities in Africa (Macpherson and Wachira 1997a). There was no significant difference between low-income and higher-income earners in terms of management of dogs in Freetown. Most respondents (60.1%) do allow their dogs to interact with other dogs but 39.9% do not, for fear of transfer of diseases. Foggin (1990) confirmed that contact with rabid dogs was responsible for the 90% human rabies fatalities in Zimbabwe. Wandeler et al. (1993) affirm that frequent contact between unsupervised dogs and between unsupervised dogs and humans either during playing or mating are means through which rabies and other pathogens are transmitted between unsupervised dogs and human. Ealum et al. (2001) maintained that supervised dogs are also of public health concern because they are also potential carriers of zoonosis. Results show that 59.7% of respondent did not register their dogs with any organization. This makes it difficult for recognized institutions to accurately keep data on dogs. However, 38.9% of some respondent did register their dogs, of which 22.1% with veterinary clinic, 9.7% with Ministry of Health and Sanitation and 9.0% with private clinics. Those who claim to have registered their dogs hardly take them for treatment. About fifty-five percent of respondents vaccinated their dogs against rabies which was freely provided by Sierra Leone Animal Welfare Society and 45.5% did not. Major causes of dog mortality in Freetown are due to lack of care and attention (33.3%), diseases (21.8%) and food (10.3%). These causes are consistent with other parts of sub-Saharan Africa. Death rate is high among Puppies (28.6%) and among mature dogs (32.1%). This study revealed that life expectancy of dogs in Freetown is between three to seven years. This falls within the age range of dogs reared in Zimbabwe (Butler and Bingham 2000).

CONCLUSION

Results presented in this paper will help veterinary and public health officers, bilateral and multilateral agencies in the planning and implementation of rabies control programs in Sierra Leone and other rabies affected areas. The ratio of dogs to human is consistent with that of sub Saharan Africa. This implies that dog figures can be obtained and extrapolated against national population statistics to obtain more accurate and reliable dog numbers throughout the country. Obtaining accurate and reliable statistics on dogs will help in raising awareness and sensitization of the entire Sierra Leonean public. This will help in teaching ideal management practices to children at schools and among dog owning families, thereby making people to grow more interested in dog and animal management. Constant

attention and care given to dogs will help in control of rabies in Sierra Leone.

Authors' Contributions

Roland Suluku conceived the ideas, designed the questions with assistance of Dr Wanda and edited the questionnaire. R. Suluku, administered the questionnaire, analyzed the results and coordinated the entire process. All authors read and approved the final draft.

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