

Ecological survey of dog population and ownership care system in Jos-south Local Government Area of Plateau State, Nigeria

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ABSTRACT: Dog ecology has impact on effectiveness of dog management and disease control strategies in a society. The study was carried out in Jos South Local Government Area of Plateau State, Nigeria from November 2017 to April 2018 to determine the ecological survey of owned dog population and ownership care system of dogs using questionnaires. Age, sex, breed, management of dogs, diseases knowledge and response to vaccination protocol among dog owners were analysed. Out of 600 households visited, 1,253 dogs were found with each house hold having an average of 2 dogs using incidental technique method. The dogs comprise of 583 males and 670 females out of which 26.5 and 23.5% where under intensive and extensive care system of management respectively, while 50% of the dogs were under semi-intensive care system. The major reasons for keeping these dogs are security (75.7%) and breeding (18.3%) and the rest is 6%, while the most common sources of dogs is through buying (60.1%). The vaccination coverage in the area surveyed was 70.3% while the most common occurring diseases as reported by the owners were found to be helminthosis (54.2%), myiasis (12.5%), mange (8.0%) and the rest is 25.3%. The result also showed male to female ratio of 1:1.2 and a dog to house ratio of 2:1. Furthermore, the respondents were aware of vaccination (79.8%) but some reported that the vaccination was not necessary (20.2%) and therefore did not vaccinate their pets. Among those that vaccinate, majority (64.9%) vaccinated against rabies disease only, despite helminthosis was the disease mostly reported by the respondents. It was recommended that intensive management care system of the dogs and adequate health care which includes proper de-worming and vaccinations with its vaccination schedule should be adopted by the owners in the study area. Awareness campaign on the need for vaccination of dogs should also be advanced in order to prevent the deadly diseases of pets in the locality.

Keywords: Disease, dog population, ecological survey, Jos South, management practice, Plateau State, vaccination.

INTRODUCTION

An understanding of domestic dog ecology has been recognised as central to the design of effective control programs for stray dogs (Slater, 2001; Cleaveland et al., 2003). It is generally accepted that dogs, *Canis familiaris*

were first tamed and then domesticated from the wolf, probably one of the smaller sub species of *Canis lupus pallipes* (Raisor, 2004). The relationship between human and dogs began in prehistoric times, some 12,000 years

ago, about the time people started living in villages. Sheep and goat are traced back approximately 10,000 years, while cats about 5000 years (Kantere et al., 2014).

The human population of Africa expanded enormously during the 20th century, and the dog population expanded in parallel (Hambolu et al., 2014). In Africa, dogs are intimately dependent on humans for food and shelter (Hambolu et al., 2014), and this association means that dog population can be correlated, in size as distribution with human populations. The dog-human ratio most commonly lies between 1:6 and 1:10, but considerable variation exists. The ratio of owned dogs to people are usually higher in rural areas of a country, but there is also considerable variation within cities (Gbeminiyi et al., 2014). The structure and turnover of a dog population are determined by a great number of different factors. Some dog population density studies in Nigeria have been carried out applying techniques such as total streets dog count and estimate from the rate of capture and recapture (Gbeminiyi et al., 2014). Planning control programmes for this dog borne zoonosis requires information on the size and population dynamics of dogs in a particular location (Prosperi et al., 2000).

The dog was the first species to be domesticated (Larson and Bradley 2014; Perri, 2016) and has been selectively bred over millennia for various behaviours, sensory capabilities, and physical attributes (Machugh et al., 2016). Their long association with humans has led dogs to be uniquely attuned to human behaviour (Berns et al., 2012) and they are able to thrive on a starch-rich diet that would be inadequate for other canid species (Axelsson et al., 2013). Dogs vary widely in shape, size and colors (Nikhil, 2016).

Dogs perform many roles for humans such as hunting, herding, pulling loads, protection, assisting police and military, companionship and, more recently, aiding handicapped individuals and therapeutic roles. This influence on human society has given them the sobriquet "man's best friend" and was the first animal to be domesticated widely kept as household pets for security, hunting, source of meat and leading of the blind (Larson et al., 2012; Okubanjo et al., 2013). The importance of dogs as pets to humans cannot be overemphasized, since ancient times, dogs have served as hunters and trackers, instruments of war, and healers of both the physical and emotional problems of humans (Carmichael, 2003). Dog population is estimated to be between 700 million and one billion in the world, making them the most abundant member of the order *Carnivora* (Hughes and Macdonald, 2013). There has been increased interest in keeping dogs in Nigeria for the reasons mentioned above (Kamani et al., 2011). In Nigeria, dog population was estimated to be 4,500,000 (Terzungwe et al., 2018).

Problems have been associated with the ever-increasing dog population especially free roaming dogs. These include; human and livestock biting, barking and fighting, indiscriminate defecation and transmission of diseases like

rabies (Berk, 2000). Domestic dogs are the main reservoir of rabies and other zoonotic diseases throughout the developing world (Artois et al., 2001). This may have enhanced persistence of the virus in the local (indigenous) dog population and greater movement of infected dogs (Bingham, 2005). In Africa and Asia, an estimated 24,000 to 70,000 people die of rabies each year (Knobel et al., 2005) and the domestic dog is the main source of exposure and primary vector of this important human disease (Wang, 2006). Before a practical solution can be found for community health problems associated with dog populations, the public's attitudes on issues related to responsible dog ownership must be determined (Prosperi et al., 2000; Okoh, 2007).

Thus, this research aims at determination of the population density of dogs and the pattern of dog ownership with its associated disease occurrences as reported by the owners in Jos south Local Government Area of Plateau state which will provide baseline data on the ecology of dogs and ownership care system of dogs in the study area.

MATERIALS AND METHODS

Study area

A cross-sectional study was carried out to evaluate dog ecology and dog ownership care system in Jos South Local Government Area, Plateau State, Nigeria from November 2017 to April 2018. Questionnaires and oral interview were used to carry out this study (Supplementary Table 1).

Sampling technique

Three districts were randomly chosen to be surveyed – Gyel, Vwang and Kuru. In these districts, ten villages were picked at random and twenty questionnaires were distributed in each of the villages using incidental technique method. Age estimation was done using the questionnaire.

Sample size

Here, six hundred (two hundred samples from each district) samples were chosen as the sample size as convenient to determine the sample size (NIPOST, 2009). After visiting the house that have dog(s), the next house that owns a dog will be inquired until the sample size of each village was gotten. Mallo and Anigbogu (2009) stated that there is no estimated number of households in Jos which comprised Jos North and South Local Government Areas in the State.

Data analysis

Data obtained were analysed using frequencies and simple percentage and the results were presented in tables.

RESULTS

The results from the three districts of Jos South Local Government Area were obtained. A total of 600 households that owned dogs were visited and the total number of dogs sampled were found to be 1,253.

Demography of dogs in the study area

In the districts visited, females had a percentage of 53.5% and the males had a percentage of 46.5%, exotic breed had 16.3% of the population, indigenous breed had the highest population of 71.1%, mixed breed had a total of 12.6%. The population of their age range in percentage are 27.2% for 0 to 6 months, 24.2% for 7 to 12 months and 48.6% for >12 months. There are higher percentage of females to males, more indigenous breed compared to other breeds and higher population of adult dogs within the range of greater than 12 months compared to other age range in the districts visited (Table 1).

Sources and purpose of keeping dogs

This part of the survey was aimed at determining the means of acquisition and purpose of acquiring the dogs. The means of acquisition of dogs was discovered to be through purchase (60.1%), gifts (11.7%) and by birth from the owned bitches (28.2%). The purpose of keeping dogs were found to be for security reason (75.7%), pet (3.8%), hunting (0.7%), breeding (18.3%) and others (1.5%) (Table 2). The result obtained showed that buying is the main source of obtaining dogs while gifts is the least whereas security is also the main purpose of keeping dogs in the study area.

Management system

The result showed that dogs that were totally confined were 26.5%, those that were partially confined were 50%, while 23.5% of the dogs roam about. The sources of dog's food as reported were household human food (61.7%), home-made dog food (33.3%) and commercially made food (5%) (Table 3).

Vaccination management of dogs

Based on vaccine awareness, 64.9% of dog owners were

Table 1. Demography of dogs in Jos-south Local Government Area of Plateau State (N=1,253).

Demographic parameters	Frequency	Percentage (%)
Sex		
Male	583	46.5
Female	670	53.5
Breeds of dogs		
Exotic	204	16.3
Local	891	71.1
Mixed	158	12.6
Age (months)		
0-6	341	27.2
7-12	303	24.2
>12	609	48.6

Table 2. Source and purpose of keeping dogs Jos-south Local Government Area of Plateau State.

Source/purpose	Frequency	Percentage (%)
Sources of dogs		
Bought	753	60.1
Gift	146	11.7
Offspring	354	28.2
Total	1253	100.0
Purpose of keeping dogs		
Security	948	75.7
Pet	48	3.8
Hunting	9	0.7
Breeding	229	18.3
Others	19	1.5
Total	1253	100.0

aware of anti-rabies vaccine (ARV), 12.5% were aware of DHLPP (canine distemper, canine hepatitis, leptospirosis, canine parvovirus enteritis and para-influenza vaccine) while 22.6% of the respondents were aware of both ARV and DHLPP (Table 4).

Majority of respondents (70.3%) in the study area vaccinate their dogs while few (29.7%) do not vaccinate their dogs, while 278 (65.9%) out of those that vaccinated their dogs gave the vaccination as advised by the veterinarians but 144 (34.1%) administer the vaccination at their will (non-compliance) (Table 4).

For those that did not vaccinate their dogs, 23.0% gave cost as a reason of not vaccinating their dogs, 20.8% gave no reason, 25.8% said is not necessary, 20.2% are not aware of the vaccinations given to dogs while 10.1% respondents gave other reasons (Table 4).

Table 3. Management system practices of keeping dogs by respondents in Jos-south Local Government Area of Plateau State.

Management system practice	Number of dogs	Percentage (%)
Confinement		
Totally confined (Intensive management)	332	26.5
Partially confined (Semi-intensive management)	627	50.0
Not confined (Extensive management)	294	23.5
Total	1253	100.0
Source of food to dogs		
Household food	773	61.7
Home-made dog food	417	33.3
Commercially made food	63	5.0
Total	1253	100.0

Table 4. Vaccination management of dogs by dog owners in Jos-south Local Government Area of Plateau State.

Vaccination Awareness/status	Frequency	Percentage (%)
Vaccination awareness		
Rabies vaccine	813	64.9%
DHLP-P vaccine	157	12.5%
Both vaccine	283	22.6%
None	0	0%
Total	1253	100.0
Vaccinate or not		
Yes	881	70.3
No	372	29.7
Total	1253	100.0
Vaccination frequency		
As advised	581	65.9
At convenience	300	34.1
Total	881	100.0
Reasons for not vaccinating		
Cost	86	23.1
No reason	77	20.8
Not necessary	96	25.8
Not aware	75	20.2
Others	38	10.1
Total	372	100.0

Table 5. Common diseases in in Jos-south Local Government Area of Plateau State.

Diseases	Frequency	Percentage (%)
Helminthosis	679	54.2
Myiasis	157	12.5
Mange	100	8.0
Others	317	25.3

Common diseases of dogs in the study area

Helminthosis was identified by the respondents as the major trending disease in the study area with 54.2% evident by the presence of worm segments in the stool, myiasis had 12.5%, mange 8.0% and other diseases 25.3% (Table 5).

DISCUSSION

The dog-house ratio as obtained from this study was 2:1 which shows that each house visited had an average of two dogs. This partially disagreed with data obtained from a related study which gave dog-human ratio of 1:21 in Lagos urban and 1:45 in the rural areas, 1:27 and 1:3 in the Christian southern Kaduna (Ezeokoli et al., 1984). This variation may have resulted from the increase income and economic status of the area, security, cultural background etc. In developing countries, dog population is influenced by tradition and cultural background as well as socio-economic activity of the people (Luga et al., 2018).

The structure of dog population in the study area was evaluated by age, sex and breed percentage. Based on sex, the number of female dogs were more than the male (1:1.2). This is in agreement with the findings of Oboegbulem and Nwakonobi (1989) in Lagos urban and Lagos rural areas and also Hambolu et al. (2014) who reported higher number of female dogs in their studies. This indicated that there is preference for female over male dogs which may be connected with the use of dogs for breeding purpose and also pets because of its docile nature as male dogs have high tendency of straying away.

Based on the age, majority of the dogs were adult (48.6%) which were more than 12 months. This may be because the younger dogs are sold out of the study area after weaning, breeding value or due to security purpose. This may be as suggested by Hambolu et al. (2014) who opined that most dog owners are more interested with security or companionship.

It was observed that the highest population of dogs

based on breed was the indigenous breed (71.3%) which could be due to the cultural beliefs of the study location as the indigenous breed is a delicacy in this location. Again, the high level of poverty among the populace and high cost of exotic and mixed breed of dogs as well as the feeding of such dogs results in the high number of indigenous dogs in the area as compared to the exotic and mixed breed of dog.

For the purpose of keeping dogs, security ranked highest with 75.7% owing to increased security challenges in the study area. Guard duties have been identified as the primary reason for keeping dogs in a number of states in Nigeria (Oboegbulem and Nwakonobi, 1989).

The result shows that dogs that were confined (intensive management system) constituted 26.5% which were less compared to 64.1% confinement percentage among dogs in a study in Lagos State (Hambolu et al., 2014). Dogs that were not confined (completely roaming dogs) ranked lowest with 23.5%. Majority of the dogs (50%) were managed semi-intensively where they were allowed to roam about and later come back to their houses. This may be due to economic status of the owners which may affect the owners' care system. This level of roaming dogs brings them into close physical contact with other dogs and humans, that is, increased dog-dog or dog-human contact rates, thereby increasing transmission intensity and spread of zoonotic diseases present in the population. They may also serve as public health threats through physical injuries to humans through their bites, a bite which may be malicious or due to defensive aggression (protection of territory and resources including resting places, offspring and caregivers).

Dogs fed with household food was 61.7% while 33.3% fed with home-made dog food. Only few fed with commercially made dog food which was the least (5.0%). This may be due to low-income status of the owners which made them to feed the dogs with their left-over food particles from the house.

From this survey, it showed that all the respondents were aware of vaccination with higher population of the respondents being aware of rabies vaccination alone while few knew about both rabies and DHLPP with the least population knew about DHLPP alone. Majority of respondents (70.3%) in the study area vaccinated their dogs but 29.7% did not vaccinate their dogs while 65.9% out of those who vaccinate their dogs follow the vaccination schedule as advised by the veterinarian but 34.1% take their dog for vaccination at their own convenience. Out of those that did not vaccinate, some of the respondents (25.8%) agreed that there was no need to vaccinate their pets while only 23.1% complained of the cost of vaccination. This also showed that they may not be aware of the need of vaccinate their pets which reflects the level of care given to the dogs by this group. The lack of vaccination supports the reports of Bata et al. (2011), Ogbu et al. (2016) and (2017) who reported high rate of rabid dog bite, high prevalence of canine parvoviral infection and canine distemper infection in the study area.

The most common diseases found in the study area were helminthosis (54.2%), while mange was the least with 8.0%. This may reflect the extent of health care given to the dogs by the owners who still believe in the use of concoctions or herbs to treat animal diseases.

Conclusion

In conclusion, the average dog to household ratio in the study area is 2:1 which mostly indigenous adult female dogs where majority of the dogs are kept under semi-intensive management system for security purpose. Despite awareness of pet's vaccinations, majority vaccinated against rabies disease only while helminthosis was the disease mostly reported by the respondents.

Recommendations

It was recommended that intensive management care system of the dogs and adequate health care which includes proper de-worming and vaccinations with its vaccination schedule should be adopted by the dogs' owners in the study area. Awareness campaign on the need for vaccination of dogs should also be advanced in order to prevent the deadly diseases of pets in the locality.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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Supplementary Table 1

Questionnaire for Demographic and Ecological survey of dog population in Jos-South Local Government Area, Plateau State. All information provided below will be treated with absolute confidentiality. Tick appropriately or fill in the space provided where applicable.

SECTION A: DEMOGRAPHY OF DOG/MANAGEMENT

1. District's Name _____
2. Name of village _____
3. House Serial number _____
4. Age of dog and number: (a) 0 – 6 months _____ (b) 7 – 12 months _____ (c) Above one year _____
5. Sex of dog and Number: (a) Male _____ (b) Female _____
6. Breed of Dog and Number: (a) Exotic _____ (b) Local breed _____ (c) Mixed breed _____
7. Source of dog (a) Bought [] (b) Given as gift []
8. Purpose for keeping your dog: (a) Security [] (b) pet [] (c) Hunting [] (d) Breeding [] (e) Others _____
9. Sources of dog's food: (a) Family garbage and waste [] (b) Properly/specially prepared food [] (c) Commercial dog food []
10. Who feeds your dog? (a) You [] (b) household members [] (c) Neighbors []
11. Are your dogs confined? Yes [] or No []
12. Are your dogs housed? Yes [] or No []
13. Are there un-owned dogs in your neighborhood? Yes [] or No []

SECTION B: VACCINATION HISTORY

1. Do you vaccinate your dog(s)? Yes [] or No [] If Yes _____
2. How often do you vaccinate the dog(s)? (a) As advised by veterinarian [] (b) At convenience [] If No _____
3. What is the reason(s) for not vaccination the dog(s)? (a) Not necessary [] (b) Cost [] (c) No reason [] (d) Not aware of vaccination [] (e) Others _____
4. Who normally vaccinate your dog(s)? (a) Veterinarian [] (b) Self []
5. Which vaccine(s) did you administer? (a) Anti-rabies [] (b) DHLPP [] (c) Others _____
6. What is the most occurring disease(s) of dogs in your household? _____