

**THE POTENTIAL HAZARDS OF STRAY DOGS IN UNIVERSITY OF MAIDUGURI,
NIGERIA**

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Abstract

A questionnaire seeking information on demography, dog management and dog – related attitudes, was administered via house – to – house to one hundred and fifty (150) volunteered staff of university of Maiduguri, Nigeria, randomly selected. Forms were collected after an agreed period of time. Data generated indicated that respondents were within the mean age of 43.7 years old, and 63% were males. Also, 64% of the respondents were not current dog owners and 36% were current dog owners. Majority (72%) of the current dog owners owned dogs mainly for security purpose. Majority of respondents perceived that dog registration help fund important animal services and could help trace back dogs to their owners in case of lost, as such do not constitute stray dogs and their potential hazards. Few (37%) of the current dog owners practiced total dog confinement. Dog owners expressed varied attitudes towards dogs and dog litter management. Unfriendly attitudes, un-useful disposal of whelped litters by dog owners, unconfined and unsterilized dogs were found to contribute to stray dogs in the community. Proper and complete dog management practices and positive dog-related attitudes will help reduce stray dogs and their potential hazards in the community.

Key words: Dog management, Potential hazards, Stray dogs, University, Maiduguri, Nigeria.

Introduction

Dog became an integral part of human economic and social system at the time man needed it for hunting several years ago (Vila *et al.*, 2006). Despite the availability of appropriate methods for quantifying dog population, official population figure of dogs is still lacking in many countries

(Bogel and Joshi, 1990) including Nigeria, although it has been estimated that domestic dogs (*Canis lupus familiaris*) constitute about five million and the most widely spread carnivores in the world (Matter and Daniel, 2000; Norwegian Kennel club, 2006). Of this dog population, an unknown but substantial proportion is assumed to be

free-roaming (Matter and Daniel, 2000) especially in many developing countries, including Nigeria. Dog has been reported to serve purposes as guarding, law enforcement, herding, hunting, message carrier, transport and important in medical field (Brewer, 2002; Kum, 2003; Shibu and George, 2012). Stray dogs were more common in high human density, low to middle income areas (Fox *et al.*, 1975; Scott and Causey, 1978), and in most cases, this group of dogs are being deprived of their quality of life, as they suffer from chronic diseases and nutritional imbalance, resulting in high mortality, low reproductive success and low performance (Boitani *et al.*, 1995; Brewer, 2002).

Dog ownership attitudes vary according to the socio-cultural and religious background of the individual dog owner: these attitudes and beliefs have been considered as predisposing factors primarily responsible for the problems of stray dogs worldwide (Matter and Daniel, 2000; Slater, 2001; Brewer, 2002). Dogs usually exhibit their attitudinal behavior of persistent barking especially at night. Previous researches have extensively dwelt on the socio-ecology of stray dogs and perceived impact posed by them on the public health (Hsu *et al.*, 2003). Their characteristic peer movements which have often shown to cause traffic accidents on high ways have been considered in cities and towns by many people as a serious public health nuisance (Matter and Daniel, 2000). Rabies is one of the major diseases of the domestic dog which have been identified to pose global challenges in human health and well-being (Talan *et al.*, 1999; Wandeler and Bingham, 2000; Kaare *et al.*, 2009) worldwide. Dog constitutes the most important reservoir of rabies in many regions of the world, particularly developing countries as sub-Saharan Africa, south-east Asia and India (Knobel *et al.*, 2008). In Africa, unlike Zimbabwe and Uganda, which have reported dramatic decline in canine rabies (Kaare *et al.*, 2009) Nigeria is

an endemic country for rabies (Dzikwi *et al.*, 2011) in which over 90% of human cases were confirmed to have been transmitted by domestic dogs (WHO, 2012), particularly free-roaming or stray dogs. The present study is the first reporting the potential hazards of stray dogs in University of Maiduguri, northeastern Nigeria. In most parts of Nigeria, particularly the northeastern region, animal protection laws are not in operation, hence pet registration and animal abandonment fines were not being enforced or imposed on animals especially dogs left to stray or roam freely. This study is aimed at providing data which could help in the design and implementation of stray dog prevention programs in University Communities.

Materials and methods

The sample of study consisted of one hundred and fifty (150) volunteered respondents who participated in the study. Participants were selected on the basis that they were members of staff of the university of Maiduguri and were not on study programs or students, and whether they own a dog or not, and on the criteria that they are resident in the university quarters. A questionnaire mainly closed-ended, consisting of two sections was developed to study dog keeping attitudes and contribution to stray dogs potential hazards in a university community in Nigeria. The first section comprised of questions relating to the participant's location within the university community, age, gender, ownership of a dog, experience in keeping dogs, reasons for keeping dogs, and age, sex, number and breed or type of dog(s) kept, inter alia. The second section consisted of questions on dog management practices such as registration, confinement, sterilization, socialization, and owner's attitudes to stray dogs in the university community. The questionnaire was administered through physical door-to-door to households in the study area between June 2009 and November 2010. More than

70% of the households in the study area were surveyed. Questionnaire were left with participants and followed up for retrieval at a time or period convenient for the respondent (which should not exceed two months), this was to give the participants adequate time to respond to the questionnaire and also to apparently eliminate bias in the study. Respondents who have misplaced the forms were provided with another copy during collection. The participants who were willing to be interviewed orally slated the date and time most convenient for them for the interview. Some of the questions required respondents to tick ‘yes’ or ‘No’ to the best of their knowledge. This was to reduce frustration to respondents who wanted to be truthful. All the 150 forms were retrieved completely filled and without mutilation, relating to 100% response rate.

Data analysis

Descriptive statistics was used to describe sample demographics. X^2 test, Confidence interval and P values were used to determine statistical differences between the responses in some variables using SPSS version 16.0 (www.spss.com, 2007). A p value < 0.05 was considered statistically significant.

Results

Demographic characteristics of participants

Of the one hundred and fifty questionnaire forms distributed to the participants, all were retrieved completely filled. This represented a final response rate of 100%. The response sample consisted of 73 (49%) academic and 77 (51%) non-academic staff, with age ranged between 30 to 60 years old and above. Our finding indicates that 56% of respondents were above 40 years old (Mean, 43.7; SD, 0.9). Gender characteristics indicated 63.3% males and 36.7% females and marital disposition of 92.7% married, 5.3% single and 2% divorced (Table 1). The Area distribution of the study participants indicated that the sample was representative of the university of Maiduguri community and is convenient for a national survey. The sample responses from residential areas showed a higher percentage of responses 21.3%, 14% and 12.7% from participants resident in NH, R and SSTH quarters respectively, implying that these quarters housed majority of the university of Maiduguri community of all cadres and positions. Other participants (6.7%) resident in G, SSTC and J quarters and 7.3% were resident in A – D quarters.

Table 1 Demographic characteristics of participants (n = 150)

Demography	Proportion (%)
Category of respondent	
Academic staff	73 (48.7)
Non- Academic staff	77 (51.3)
Gender of respondent	
Male	95 (63.3)
Female	55 (36.7)
Age of respondent in years ^a	
30 – 40	66 (44.0)
41 – 60	84 (56.0)
> 60	0 (0)
Location within study area	
SSTH Quarters	19 (12.7)
G Quarters	10 (6.7)
NH Quarters	32 (21.3)

H Quarters	12 (8.0)
SSTC Quarters	10 (6.7)
R Quarters	21 (14.0)
J Quarters	10 (6.7)
A – D Quarters	11 (7.3)
P Quarters	6 (4.0)
Marital status	
Married	139 (92.7)
Single	8 (5.3)
Divorced	3 (2.0)

^a (Mean, 43.7; SD, 0.9)

Dog ownership patterns

More than half (64%) of the participants in this study were non-dog owners, 36% were dog owners and 22.7% never had a dog in their life time (table 2). However, 37.3% of the respondents reported having had a dog before (in the past), 40% reported to have had dogs at childhood. Majority (72.2%) of the current dog owners in the present study owned 1 dog, 18.5% owned 2 dogs and 9.3% owned more than 2 dogs. Of the current dog owners 70.4% had male dogs and 29.6% had female dogs. The dogs referred to in this study were of mean age group of 3.7, with less than 1 year old (11.1%), 1 to 3 years old (48.2%) and over 3

years old (40.7%). The most common type or breed of dogs owned by the respondent dog owners was the local or indigenous dog (74.1%), followed by cross or mongrel (18.5%) and exotic or pure breed (7.4%). The primary purpose of owning a dog as reported by the current dog owners was for security or guarding (72.2%) and companionship (27.8%). None of the participants owned dogs for other purposes such as breeding, herding, hunting, meat, tracking criminals, etc. Our result also indicated that 14.8% of the dog owners had had dogs for a period of 1–5years, 24.1% for 6–10 years and 61.1% had dogs for more than 10 years.

Table 2 Dog ownership pattern (n = 150)

Ownership Pattern	Proportion (%)
Previous history of dog ownership	
Had a dog at childhood	60 (40.0)
Had a dog before (in the past)	56 (37.3)
Never had a dog before	34 (22.7)
Currently did not owned a dog	96 (64.0)
Currently owned a Dog	54 (36.0)
Number of dogs owned ^a	
1	39 (72.2)
2	10 (18.5)
> 2	5 (9.3)
Sex of dog owned ^a	
Male	38 (70.4)
Female	16 (29.6)
Age of dog owned ^a	
< 1 year	6 (11.1)
1 – 3years	26 (48.2)

> 3 years	22 (40.7)
Breed of dog owned ^a	
Exotic (pure breed)	4 (7.4)
Local	40 (74.1)
Cross	10 (18.5)
Primary purpose for keeping dog ^a	
Companion	15 (27.8)
Security (guarding)	39 (72.2)
Breeding	0 (0)
Others ^b	0 (0)
Duration in having a dog ^a	
1 – 2 years	8 (14.8)
2 – 5 years	13 (24.1)
> 5 years	33 (61.1)

^a Current dog owners (n = 54); ^b Hunting, Herding, Tracking, Meat, etc.

Dog registration and socialization as aspects of stray Dogs management practices

Investigation of Participants' attitudes to 'dog registration and socialization' as aspects of stray dog management practices in the university of Maiduguri community (table 3) showed that 39.3% of respondents opined that 'all dogs should be registered', whilst majority had negative attitudes to dog registration (60.7%). More than half of the participants agreed that 'dogs should be registered but not compulsory' (74.0%) whereas, 26.0% were of the view that 'dogs should be registered and compulsory'. Respondents' views on whether 'registration of dogs help fund important animal services' showed 71.3% responses for 'Yes' and 28.7% for 'No'; and 72.7% respondents answered 'Yes' whilst 27.3% answered 'No' as to whether 'registration of dogs could help trace its owner in case of lost'. Also 79.3% were willing to register own dog whereas 20.7%) were unwilling to register own dog.

On dog socialization, 43.3% agreed that 'socialization of dog makes it friendly', whereas 56.7% disagreed. Also 43.3% were of the view that 'Socialization of dog keeps it safe' but 56.7% were not comfortable with the view. 'Socialization of dog prevents it from being a nuisance' was supported by 44.0% and disapproved by 56.0% of the respondents. Over half of the respondents viewed that 'socialization of dogs is difficult' (56.7%). Also 57.3% of participants had positive affirmation that 'socialization of dogs is necessary', while 46.7% had contrary view. More than half (59.3%) of respondents agreed that 'younger dogs should be socialized than older dogs', while 40.7% disagreed. There was also controversy over socialization of exotic dogs, as 60.7% went for 'Exotic dogs should be socialized than local dogs' and 39.3% went against. Also 63.3% respondents opined that 'socialization of dog prevents it from harming other animals or people around it' and 36.7% respondents were not conversant as it relates to management of stray dogs.

Table 3: Dog registration and socialization as aspects of stray dogs management (n = 150)

<u>Variable</u>	<u>Proportion (%)</u>	<u>95% Conf. Interval</u>	<u>P value^a</u>
Should all dogs be registered?			
Yes	59(39.3)	0. 315 – 0. 471	0. 3300
No	91(60.7)	0. 529 – 0. 685	
Dogs should be registered but not compulsory			
Yes	111(74.0)	0. 670 – 0. 810	0. 2090
No	39(26.0)	0. 190 – 0. 330	
Dogs should be registered and compulsory			
Yes	39(26.0)	0. 190 – 0. 330	0. 2090
No	111(74.0)	0. 670 – 0. 810	
Does registration of dogs help fund important animal services?			
Yes	107(71.3)	0. 608 – 0. 817	0. 2327
No	43(28.7)	0. 215 – 0. 359	
Does registration of dogs help trace its owner in case of lost?			
Yes	109(72.7)	0. 656 – 0. 798	0. 2177
No	41(27.3)	0. 202 – 0. 344	
Are you willing to register your dog?			
Yes	119(79.3)	0. 728 – 0. 858	0. 1949
No	31(20.7)	0. 142 – 0. 272	
Does socialization of dog make it friendly?			
Yes	65(43.3)	0. 351 – 0. 508	0. 4641
No	85(56.7)	0. 020 – 0. 093	
Does socialization of dog keep it safe?			
Yes	65(43.3)	0. 351 – 0. 508	0. 4641
No	85(56.7)	0. 020 – 0. 093	
Does socialization of dog prevent it from being a nuisance?			
Yes	66(44.0)	0. 356 – 0. 520	0. 4681
No	84(56.0)	0. 481 – 0. 639	
Is socialization of dog difficult?			
Yes	85(56.7)	0. 020 – 0. 930	0. 4641
No	65(43.3)	0. 351 – 0. 508	
Is socialization of dogs necessary?			
Yes	86(57.3)	0. 494 – 0. 652	0. 4404
No	64 (42.7)	0. 348 – 0. 506	
Should younger dogs be socialized than older dogs?			
Yes	89 (59.3)	0. 514 – 0. 672	0. 4483
No	61(40.7)	0. 328 – 0. 486	
Should exotic dogs be socialized than local dogs?			
Yes	91(60.7)	0. 529 – 0. 685	0. 3300
No	59(39.3)	0. 315 – 0. 471	
Does socialization of a dog prevent it from harming other animals or people around it?			
Yes	55(36.7)	0. 290 – 0. 444	0. 3015
No	95(63.3)	0.566 – 0.710	

^a no significant difference (p > 0.05)

Attitudes and Dog management practices in the University of Maiduguri Community

Of the 150 participants interviewed very low percentage expressed attitudes of being annoyed with the presence of stray dogs around their premises (8.0%). The participants who confined dogs completely in pens were (15.3%), and those that confined dogs indoors but released only at night were (65.3%). Those who confined dogs indoors except when taken out on walks were (19.3%). Participants who attested that confinement keeps dogs safe (38.7%), keeps dogs from being a nuisance (45.3%) and prevents dogs from other animals and people (96.7%) were optimistic. Those that were of the view that

confinement is unnatural and expensive were (52.0%) and (80.0%) respectively (table 4). Respondents also believed that confinement may prevent dogs from roaming the street (98.7%). Some respondents reported that neutering a dog prevents it from roaming freely (16.0%), and feeding a dog special diet prevents it from scavenging around the environment (9.3%). About 11.3% of respondents indicated having lost a dog before. Respondent participants had varied attitudes towards management of litters of whelped dogs: (6.0%) threw away litters or unwanted puppies, (22.0%) dashed or given out litters and (72.0%) had indifferent attitudes towards litter management.

Table 4: Attitudes and dog management practices in the university of Maiduguri (n = 150)

Attitudes/management practices	Proportion (%)
Annoyed with presence of stray dogs around premises	12 (8.0)
Confined dogs completely in pens	23 (15.3)
Confined dogs indoors but released only at night	98 (65.3)
Confined dogs indoors except when taken out on walks	29 (19.3)
Affirmed confinement keeps dogs safe	58 (38.7)
Affirmed confinement keeps dogs from being a nuisance	68 (45.3)
Affirmed confinement prevents dogs from other animals and people	145 (96.7)
Affirmed confinement is unnatural	78 (52.0)
Affirmed confinement is expensive	120 (80.0)
Affirmed confinement prevents dogs from roaming the campus	148 (98.7)
Neutered dog to prevent it from free roaming	24 (16.0)
Fed special diet to dog to prevent it from scavenging	14 (9.3)
Had lost a dog before	17 (11.3)
Management of litters or unwanted puppies of a whelped dog	
Threw away	9 (6.0)
Dashed out	33 (22.0)
Indifferent	108 (72.0)

Dog ownership attitudes responsible for potential dangers of stray dogs

Ownership attitudes towards stray dogs are presented in table 5. The participants (2.7%; academic staff) and (13.0%; non-academic staff) were Friendly to dogs, 58.9% (academic) and 54.5% (non-academic) staff respondents were not generally friendly to dogs, whilst (38.4%) and (32.5%)

respectively had indifferent relationship to dogs. Majority (95.9%) academic and (64.9) non-academic staff respondents were aware of the dangers of stray dogs, whilst (4.1%) and (35.1%) respectively were not aware. Respondents who drove away stray dogs from their houses were 71(97.3%) academic and 67 (87.0%) non-academic staff participants. while 2(2.7%) and 10 (13.0%)

respectively encouraged the presence of stray dogs around their houses. Coincidentally equal numbers of academic and non-academic staff participants in the sampled population 27(37.0%) and 27 (35.1%) indicated current ownership of dogs during the study period, while, 46(63.0%) and 50(64.9%) respectively were not current dog owners. Of the current dog owners 3(11.1%) academic staff owned exotic dogs, whereas 1(3.7%) non-academic staff owned exotic dogs. Local dogs were owned by 17(63.0%) academic and 23 (85.2%) non-academic staff respondents. Our result also indicated that 8 (29.6%) of the academic and

2(7.4%) of non-academic staff participant dog owners confined their dogs indoors in dog kernels or pens, whilst, 19(70.4%) and 17(63.0%) respectively confined their dogs indoors but not in pens. None of the participant academic staff dog owners kept dogs unconfined, whilst 18(29.6%) of the respondent non-academic staff dog owners kept their dogs unconfined. Also 9(33.3%) of the sampled dog owning academic and 5(18.5%) non-academic staff used commercial dog feed formula, whilst 18(66.7%) and 22(81.5%) respectively used household foods in maintaining their dogs.

Table 5 Dog ownership attitudes responsible for potential dangers of stray dogs

Variable	ACAD (n = 73)	NAC (n = 77)	Total (n = 150)	95% Conf. Interval
Relationship to dogs				
Friendly	2(2.7)	10(13.0)	12(8.0)	-0.056 – 0.169 (0.4129)
Not friendly	43(58.9)	42(54.5)	85(56.7)	-0.156–0.480 (0.4840)
Indifferent	28(38.4)	25(32.5)	53(35.3)	-0.106–0.326 (0.4721)
Awareness of dangers of stray dogs				
Aware	70(95.9)	50(64.9)	120(80)	-0.074 – 0.228 (0.4052)
Not aware	3(4.1)	27(35.1)	30(20)	-0.074 – 0.228 (0.4880)
Attitudes towards stray dogs				
Drive them away from my house	71(97.3)	67(87.0)	138(92)	-0.055 – 0.169 (0.2514)
Do not drive them away	2(2.7)	10(13.0)	12(8.0)	-0.036 – 0.120 (0.4129)
Number owning a dog	27(37.0)	27(35.1)	54(36.0)	-0.107–0.330 (0.4920)
Number not owning a dog	46(63.0)	50(64.9)	96(64.0)	-0.107–0.330 (0.4920)
Breed of dog owned ^a				
Exotic	3(11.1)	1(3.7)	4(2.7)	-0.035 – 0.107 (0.1314)
Mongrel	17(63.0)	23(85.2)	40(26.7)	-0.096–0.296 (0.4641)
Cross	7(25.9)	3(11.1)	10(6.7)	-0.054 – 0.166 (0.0618)
Management of owned dog ^a				
Confined in dog kernel or pen	8(29.6)	2(7.4)	10(6.7)	-0.53 – 0.163 (0.4129)
Confined indoors but not in pen	19(70.4)	17(63.0)	36(24.0)	-0.096 – 0.296 (0.4761)
Kept dogs unconfined	0(0)	18(29.6)	8(5.3)	-0.146 – 0.450 (0.3264)
Fed commercial dog feed	9(33.3)	5(18.5)	14(9.3)	-0.063 – 0.195 (0.0721)
Used local household foods	18(66.7)	22(81.5)	40(26.7)	-0.096–0.296 (0.4801)

^a n = 27; figures in parentheses but not bolded are percentages; bolded figures are P values (No significant difference between groups with p > 0.05).

Discussion

The present study dealt with stray dogs and their potential hazards, focused on a small

sample area, the University of Maiduguri Community; thus generalization of the results may be with caution when comparing

with other studies. Dog keeping confers various benefits to individual dog owners and the community as well (L'Abate, 2007). However, high degrees of dog ownership were associated with certain disadvantages (Rohlf *et al.*, 2010) like road accidents, caused by roaming or stray dogs, and neighbourhood disputes caused by persistent dog barking (Kayrooz *et al.*, 2003). This probably explains why in the present study, out of 150 respondents only 54(36%) owned dogs during the period of study. It has been shown that sampling exclusively dog owners for attitudinal studies Ellingsen *et al.*, 2010) may result in an incomplete data. The present study has considered both dog owners and non-dog owners alike. Non-dog owners formed more than half of the study population, although some had previous history of dog keeping.

Demography and dog ownership patterns

Many of the participants in this study had dogs previously either at childhood (40.0%) or adulthood (37.3%), implying dynamism in dog ownership in a growing population. Recent finding elsewhere (Westgarth *et al.*, 2007) reports 62% of a sampled population having owned dogs in the past, supporting the present study. Previous researches shows that current pet owners have high significant levels of positive attitudes to dogs, and are more attached to their dogs than those who do not keep pets (Kid and Kid, 1994; Taylor and Signal, 2005). More so, childhood exposure to dog-keeping does correlates with adulthood ownership of a dog Serpell, 1981; Paul and Serpell, 1993), and so keeping a dog at childhood does translate to adult lifestyle. In the present study majority of current dog owners in the University of Maiduguri community indicated having been associated with pets at childhood age, and majority (61%) indicated having kept dogs for as long as 10 years or more; thus supporting the previous reports.

The participants in this study were mostly aged between 35 to 60 years or above, average, 43.4, compared to 43.2 elsewhere

(Sallander *et al.*, 2001), and were intellectuals so their responses may not have been bias but truthful as learned community. The higher percent of participants in this study were married and most were males and more than half were over 40years of age. This may imply that marital status, age and gender may be possible predictors of dog ownership. Gender has been reported as one of the most stable factors influencing ownership of companion animals (Paul, 2000; Herzog, 2007). More than one third of the respondents in this study were females, consisting of academic and non-academic staff of the University of Maiduguri. This made the research a representative of the study area as respondents were widely distributed across the study area. It has been insinuated that better educated individuals were more likely to own dogs, and were said to be less likely espouse to traditional beliefs, as such they may likely be more open to accepting new ways of thinking of dogs and their role in the community or society (Hsu *et al.*, 2003). The finding in the present study indicated 36% of the participants owning dogs, although slightly over one third of the sampled population. It is of note that most of the dog owners were highly educated, thus agreeing with the insinuation. The proportion of the sample population owning a dog and the average household ownership, 36% and 1.4 respectively in this study, compared to the proportions reported elsewhere: 31% and 1.2 in Australia (Robertson *et al.*, 1991), 36.1% and 1.7 in USA (Wise *et al.*, 2002), 22.9% and 1.6 in Taiwan (Hsu *et al.*, 2003), 24.0% and 1.3 in UK (Westgarth *et al.*, 2007) and 13.7% and 2.2 in Tanzania (Knobel *et al.*, 2008), by implication indicates a high attitudes towards dog keeping in Nigeria.

The finding in this study indicated that majority of dogs kept on the campus were between the age ranges of 1–3years old. A dog at this age range is strong and agile, with high physical performance, and ability to guard the house or provide security to the

owner. Reports from previous studies indicates that 69% of dog owners kept dogs mainly for companionship and 16.7% for hunting (Sallander *et al.*, 2001) and 61.9% kept dogs mainly for security, to guard the household against human intruders (Knobel *et al.*, 2008). Some studies elsewhere (Katcher, 1982; Feldman, 1997; Hsu *et al.*, 2003; Westgarth *et al.*, 2007) report companionship as the main purpose for dog ownership. In this study the current dog owners reported security (72.2%) and companionship (27.8%) as main primary purpose for keeping dogs, which concur with the previous findings (Sallander *et al.*, 2001; Knobel *et al.*, 2008). Dogs kept for herding, working, sporting, fun etc. have recently been explained (Shibu and George, 2012). The most common type of dog owned by participants in this study was local or indigenous dog, followed by cross breed and only 2.6% pure or exotic dogs (species not considered in this study). The non-indication of herding, sporting or fun by owners in this study as purposes for owning dogs was possibly due to low ownership of exotic dogs, since they are the types that can easily be trained to perform these functions. Our finding also indicated that participants displayed a strong affinity or preference to male dogs (25.3%) than to female dogs (10.6%). This probably may be attributed to the perception that female dogs contribute to stray dogs by attracting the attention of free-roaming male dogs. It may also be that male dogs appear to be stronger than female dogs or they were more liked for their masking barking voice. It also may be that dog owners tended avoiding unwanted puppies by not keeping female dogs.

Attitudes and dog management practices

The management practice adopted by any pet owner is dependent upon the purpose for acquiring such a pet. Dogs which are kept indoors but not confined tended to be primarily kept as companion animals (Hsu *et al.*, 2003), and dogs acquired primarily for the purpose of security or guarding are often

kept confined indoors and seldom released indoors at night times. Recent report indicates that 25% of dog owners keep their dogs indoors (Slater *et al.*, 2012). Our result indicated that some dog owners kept their dogs indoors confined in pens and majority kept their dogs unconfined indoors. This implied that the owners appeared to acquire their dogs for companionship rather than for security or guarding according to the condition explained by Hsu *et al.* (2003), despite the indication by the majority (72.2%) of the dog owners that they owned their dogs for security purpose. Dogs that are kept mainly for companionship may have lost some of their instrumental roles, like hunting, guarding, sporting etc (Hills, 1995). Companion dogs will always like to be beside their owners, and are likely reluctant to bark.

From the attitudinal perceptions of the participants in this study, it may be assumed that confinement of dogs was not only for companionship and security purposes alone, but as management practice aimed at preventing dogs from being free-roaming or stray dogs (98.7%). Although majority of the respondents perceived that confinement is expensive (80%) and unnatural (52.8%), some were of the view that dogs kept in confinement are safe, and are prevented from being a nuisance to the community and free from being preys to other animals and people. Dogs kept outdoors or unconfined are more likely to wander off and become lost (Hsu *et al.*, 2003) and are prone to environmental hazards. Few respondents in this study reported having lost a dog previously. A substantial number of current dog owners in this study, mainly non-academic staff (29.6%) kept their dogs unconfined. These dogs probably constituted the free-roaming dogs seen around the University of Maiduguri community without tags or collars. The practice of leaving dogs to free-roaming would facilitate spread of rabies in animal population, and would make rabies endemic and a continued

zoonotic threat to humans (Matibag *et al.*, 2007). Some studies report association of dog ownership with diseases of zoonotic risk e.g. campylobacteriosis, among young children (Tenkate and Stafford, 2001; Robinson and Pugh, 2002; Greene and Levy, 2006). Could this probably be one of the reasons why about 37.3% of the participants in this study who owned dogs before no longer owned dogs currently? Few respondents orally interviewed however, explained that they had little children, and that they were out of the house most of the time.

Sexually-intact dogs were said to more likely exhibit roaming behaviour than were neutered dogs. Previously dogs were allowed to be neutered only for medical reasons (Sallander *et al.*, 2001). In contrary, opinion of some dog owners (16%) in the present study was they neutered their dogs to prevent them from roaming freely in the streets. Traditionally, sexually-intact dogs are a nuisance to the society especially during their oestrus periods when males follow females constantly all the time, with characteristic fighting behaviour amongst themselves.

Attitudes of participants towards dog registration and socialization as aspects of stray dog management

Research has shown that dog owners who lack responsible sense, and who have failed to engage in a number of responsible ownership or dog keeping management practices such as registration, confinement, training, socialization, and feeding, amongst other things, have been perceived to contribute to several disputes in the community caused by dog keeping. Response from such dog owners may be bias and affects results emanating from studies such as the present study. However, the cons of the present study is, the study considered both those owning dogs and those not owning dogs as the sample population. If dog owners would believed that registration, socialization and neutering,

amongst other dog management practices were attitudes supported by families and friends, they would more likely solve neighbourhood disputes.

Majority of the dog owners in this study were of the view that registration of dogs is important but not compulsory, and registration helps fund important animal services, as well as help trace its owner easily in case the dog gets lost or missing. However, only few owners perceived that registration of dogs is important and compulsory as well. In Borno state and Nigeria at large, there is no provisional law, to the best knowledge of the authors, that regulates the registration of dogs unlike is obtained elsewhere (Rohlf *et al.*, 2010). This probably explains why dogs were seen within the university of Maiduguri community without collar or tags. Dogs seen roaming the streets without registration numbers, or neck collars or tags are often considered as stray dogs (Hsu *et al.*, 2003; Lord *et al.*, 2010; Weiss *et al.*, 2011) and are more likely to be lost. Collars or tags are vital instruments used to identify lost animals (Lord *et al.*, 2007).

It was assumed that socialized dogs should be friendly and free from being nuisance; such dogs often enjoy public places. According to Epley *et al* (2008), people tend to create a sense of human connection with non-human agents, like dog, cat, etc. when they failed to maintain social relationships with fellow humans. This is often described as love for dogs (Hsu *et al.*, 2003). In many developed parts of the world, dog owners socialize with their dogs, carrying them to many public places and sporting, especially in the UK (Rohlf *et al.*, 2010). In the present study however, contrary views were expressed by respondent dog owners. Most of the respondents denied that socialization makes dogs friendly, keeps dogs safe or prevents dogs from being a nuisance to the community. The respondents' perceptions were that dog socialization was not necessary, younger dogs should be

considered to socialize rather than older dogs and that exotic dogs should be more socialized rather than local dogs. Few of the respondents believed that socialized dogs are un-harmful to other animals or humans. Over 50% were of the view that socialization of dogs is difficult. Many reasons were behind these perceptions including access to safe areas where dogs can be socialized, government policy, lack of sufficient time for training and socializing dogs, as well as, lack of public supports and dog's behavior, are critical for dog socialization (Rohlf *et al.*, 2010). No matter how socialized a dog is, it always looks at an outsider as a stranger, and so there is no guarantee that the outsider would be safe when encountered with the dog. This perhaps explains why most respondents in this study were of the view that socialization cannot prevent dogs from harming other animals and people. The perception by respondents that socialization and confinement are difficult may be attached to cost and physical strength or effort, as both practices require finance and human effort.

Dog ownership attitudes responsible for potential dangers of stray dogs

In a previous study elsewhere (Ellingsen *et al.*, 2010), dog owners are shown to have high levels of positive attitudes towards dogs. In our study, dog owners expressed high levels of negative attitudes towards dogs. Majority (>50%) of these participants expressed not being friendly to dogs. While majority (92%) of the respondents most of who were academic staff drove away stray dogs from their premises, very few most of who were non-academic staff, encouraged the presence of stray dogs around their premises. The latter were more likely to adopt stray dogs, which were allowed continued roaming freely despite being owned by different owners. In Taiwan people who felt sorry or looked friendly for stray dogs adopted them and kept them outdoors (Hsu *et al.*, 2003). This behavior is not different from driving away behavior

exhibited by participants in the present study. Driving away stray dogs and keeping adopted stray dogs outdoors both constitute potential hazards of stray dogs. So is throwing away or relinquishing litters or unwanted puppies: 6% of the dog owners in this study threw away litters, 22% dashed out and 72% don't even mind whelped litters, and this could constitute stray dogs and their potential hazards.

Negative attitudes towards dogs and little or no attention to litters were said to be attributed largely by low sterilization of pets and low or no cost of obtaining the pets. Such pets are said to be at greater risk of being abandoned or relinquished by their owners (New *et al.*, 2000). Abandoned or relinquished dogs may constitute to stray dogs, and consequently to the threat of potential hazards of stray dogs. In this study, although participants were not interviewed on how they acquired their dogs, the scenario exhibited was probably not un-associated with the factors as non-sterilization of dogs or acquiring the dogs at no cost. Majority of respondents were aware of the dangers of stray dogs. Stray dogs were prone to dangers of being injured, killed by traffic or captured by animal control agencies, or tracing their way home in densely populated urban areas (Hsu *et al.*, 2003). This constitutes a bigger problem in the society. Dogs whether stray or not if driven away out of house from the university, may not likely be able to trace their way back to the campus if gotten into the town. Such dogs often constitute nuisance in the town and are liable to be exposed to traffic dangers.

Conclusion

In conclusion, the contribution of dog keeping to stray dogs is influenced by the management practices and attitudes of dog owners like confinement, feeding, registration, socialization, and relationship with dogs, the type or breed of dog and purpose for which dogs are kept. The owner's response and subsequent care

offered the animal being kept have a lot of effect on the dog and its behavior. Our result showed that the majority of our respondents were not dog owners, and might have negative attitudes towards dogs. Majority kept mongrel or local dogs (most within ages of 1 – 3 years old), some must have kept dogs for over 10 years long, and primarily for security purposes. Majority of these respondents perceived that confinement can prevent the occurrence of stray dogs. Confinement, feeding, litter management, owners’ behaviours and attitudes towards dogs, and type or breed of dog, more often than registration, and socialization, were found in this study as critical indices of dog ownership that contribute to stray or free roaming dogs and associated potential hazards in a university community.

Although this study was carried out in a small and learned community, critical factors that can lead to stray dogs have been enumerated. Further research may be carried out in a larger community with different demographics to make comparison. Although, both dog owners and non-dog owners formed the sample population of this study, comparison between the perceptions of these two groups which formed the study population is necessary.

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Conflict of interest

There is no conflict of interest to express.

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