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Demographic Profiling of Dogs and Dog Ownership in Nsukka Metropolis of Enugu State, Nigeria: a Case study using the Free Anti-Rabies Vaccination Campaign conducted at the Veterinary Teaching Hospital of the University of Nigeria, Nsukka: January-April, 2015

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ABSTRACT

This Dog ownership in Nigeria, patterns a combination of supervised and stray dogs. The latter constituting Public health challenges. This study relates ecology; dynamics of dog breeds, ownership, management; adherence/non-adherence to extant laws on dog ownership with Rabies endemicity in Nsukka. It proffers recommendations for sustainable Rabies control & vaccination campaign

Key Message

Nsukka is endemic for Rabies. Statutory control and prevention strategies do not suffice. Understanding the human-dog-interactions as core risk factors for endemicity of Rabies and breaking this link can lead to a Rabies free environment.

Abbreviations: FAO: Food and Agricultural Organisation; DFID: Department for International Development; PME: Planning Monitoring and Evaluation, WHO: World Health Organisation

Keywords: Demography, Dog, Dog Owners, Rabies, Anti Rabies Vaccination, Zoonosis

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Cover Letter

This study was carried by me and my colleagues at the Veterinary Teaching Hospital, University of Nigeria, Nsukka. Its processes, reporting and publishing are based on self- sponsorship. A waiver would be greatly appreciated. It is important to publish this work as it would buttress the fact that Nsukka is endemic for Rabies. Currently, statutory control and prevention strategies do not suffice thus Understanding the human-dog-interactions as core risk factors in endemicity of Rabies and breaking this link can lead to a Rabies free environment.

Introduction

Pets provide companionship and confer physiological, health and psychological benefits (Katcher and Friedman, 1982; Friedmann, 1985; Headey, 2003; McNicholas et al., 2005). Pet owners have fewer doctors visits (Heady et al., 2002) and longer survival following heart attack (Friedmann et al., 1980), compared to non-pet owners. Pets have also been indicated to have important roles in enhancing child development (Endenburg and Baarda, 1995), the wellbeing of older people (Burch, et al., 1995) and may also be used in a therapeutic setting (Greene and Levy, 2006). However, it has become increasingly apparent that pets are an important source of zoonotic infections particularly Rabies.

Rabies is a widespread disease in African domestic dogs (pet) and a serious public health problem in developing countries. Canine rabies became established in Africa during the 20th century, coinciding with ecologic changes that favored its emergence in canids (Rasitorshina, et al., 2009). Rabies is a zoonotic disease that causes acute encephalitis (inflammation of the brain) in warm-blooded animals. All mammals, including humans are susceptible to infection with the rabies virus. The rabies virus is the type species of the Lyssavirus genus, the family Rhabdoviridae, order Monogenavirales. The Lyssaviruses have

helical symmetry, with a length of about 180nm and cross-sectional diameter of about 75 nm (Anthea, et. al., 1993 in Uchendu, et. al., 2012). Rabies is transmitted from animals to man, most commonly through close contact with infected saliva via bites or scratches (Kienzle 2007; WHO, 2010). The incubation period of the disease is usually a few months, depending on the distance of the infective bite site from the central nervous system (CNS). Once the rabies virus reaches the CNS, if post-exposure prophylaxis is not administered prior to onset of severe symptoms, the infection is effectively untreatable and usually fatal within days (Anthea et. al., 1993; Cotran et. al., 2005 in Uchendu et. al., 2012).

Generally, the early symptoms of rabies are similar to those of many other illnesses and disease conditions, which makes for initial misdiagnosis leading to delayed management. The disease progresses into two forms, viz; the furious and the paralytic form (Durr et. al., 2008). In the furious form, the infected animal exhibits signs of hypersensitivity, excited behaviour, hydrophobia and sometimes aerophobia. After a few (4-12) days, death occurs by cardio-respiratory arrest (WHO, 2010). The paralytic form runs a less dramatic and usually longer course than the furious form. The muscles gradually become paralyzed; starting at the site of the bite or scratch. Coma slowly develops and eventually death occurs (Drew, 2004). Death usually occurs within days of the onset of these symptoms with respiratory insufficiency as the primary cause (Cotran et. al., 2005).

The vast majority of human rabies cases worldwide (approximately 97) come from dog bites (Kienzle 2007; Voice of America, 2009; WHO, 2010). Rodents and Bats, though not infected serve as healthy carries and transmitters of rabies to humans (Rasitorshina, et. al., 2009). It has also been reported that more than 95% of the human deaths due to rabies occur in the Sub-Saharan Africa with dogs as 99% source and about 40% of the

people who are bitten by suspected rabid dogs are children under 15 years (Cotran et. al., 2005). The economic and socio-cultural impacts of dog bite, rabies scare and death is also substantial as rabies is a significant cause of livestock and human deaths in several (developing) countries (Kienzle, 2007).

Control of Rabies

In the United States, animal control and vaccination programs have effectively eliminated domestic dogs as reservoirs of rabies (CDC, 2009). Several developed countries (United Kingdom, Estonia, Japan and Germany) claim to have eradicated rabies carried by animals that live on ground but that concerns exist about transmission by air-borne and mixed habitat animals including bats (Cotran et. al., 2005). However, contrary to these claims of Cotran et. al., (2005), the WHO (2010) reports that rabies is present in all continents except the Antarctica. Currently pre-exposure immunization has been used in both human and non-human population, whereas in many jurisdictions, domesticated animals are required to be vaccinated.

Uchendu, et. al., (2012) posit that Rabies can be controlled if not eradicated in Nigeria if there is strict enforcement of the extant laws on dog ownership and control; key approach being, strict annual vaccination of susceptible animals.

However, at present, despite the continuous campaign of free anti-rabies vaccination, many animal owners and pet handlers fail to vaccinate their animals. It has been noted that many dog owner, especially those who live below the UN set poverty line can hardly fend for themselves much less a dog (Uchendu, et. al., 2012). Thus, these dogs are allowed to roam and scavenge across the streets freely, day and night. During the warm seasons of the year (April to July), which coincides with the time when most female dogs approach "Heat", the male dogs scramble for the few available females and in the process dog-to-dog bite as well as dog-to-man bite are high (Uchendu, et. al., 2012).

There are cases of bites from stray dogs, which are either not formally reported or if reported, may be un-researched by a competent diagnostic laboratory. These lapses in diagnosis and control pose lots of public health threats to man and animal besides their socio-economic consequences (Uchendu et. al., 2012). Furthermore, most of these bites come from stray dogs that could not be apprehended for routine quarantine and observation (Uchendu et. al., 2012). Several factors are contributory to these perceived lapses; viz: improper training of the public health officers, lack of administrative willpower and the required financial resources, nonchalance and un-coordinated reporting systems and non enforcement of extant laws on the dog control and vaccination. Furthermore a poor culture of hospitalization, poses a major impediment; this manifest as un-willingness of dog bite patients and dog owners to present themselves and their dogs for examination and of course, un-willingness of dog owners to take advantage of free anti-rabies campaign programs (Uchendu et. al., 2012).

It is against the background of the perceived high prevalence of Rabies cases and the challenges to reporting, control and diagnosis of rabies that this work was set to approach the demographic profiling of the dogs and dog ownership in order to identify threats, risk factors and public health challenges associated with the presence of dogs particularly with respect to adherence to the extant laws on dog ownership and control. The work provides information on challenges to prevention, control and diagnosis of rabies and recommends more effective and sustainable Rabies vaccination campaign.

Materials and Methods

The Study Area

This study was carried out at the Veterinary Teaching Hospital (VTH) of the University of Nigeria, Nsukka situated at Nsukka town in Nsukka Local Government Area of Enugu State, Nigeria. Nsukka is situated at latitude

065155.870 N and Longitude 0072447.44 E (Globacom® Car tracker 2011) and possesses rain forest vegetation. The area has a humid climate with mean annual rainfall and temperature of 1037 mm and 34.7°C respectively and average relative humidity of 82% (NBS, 2012). Nsukka has been described as having stray dogs as well as being endemic for rabies (Uchendu et al., 2012). The Nsukka town with an estimated population of above 1 Million (NBS, 2012) consist of seven (7) local government areas (LGAs); these are: Igbo-Etiti, Igbo-Eze South, Igbo-Eze North, Isiuzo, Nsukka, Udeno and Uzo-Uwani. Annually, the Veterinary Teaching Hospital (VTH) of the University of Nigeria, Nsukka provides free vaccines (vaccination) to both registered and un-registered dog owners in the 7 LGAs.

Materials

In 2015, the VTH organized an only-dog, free anti-Rabies vaccination campaign; running from February 13 to April 12, 2015. Dog owners', old and new clients of the hospital, were invited to participate in the program, which was free of charge.

Vaccines were donated from the National Veterinary Research Institute VOM, Jos State, Nigeria.

For the purposes of legality and observation of due protocols, the VTH wrote formally to the Vice Chancellor of the University seeking approval and support for the Campaign program. This approval was received in good time.

Publicity about the campaign covered 3 out these 7 LGAs within Nsukka Metropolis, which were purposively selected because they are most proximal to the Veterinary Teaching Hospital since the primary target of this campaign was to protect the University and its immediate environs. These 3 LGAs which equally constitute about 60% (600,000 persons) of the entire Nsukka population are: Nsukka, Udeno and Igbo-Eze North.

The campaign was widely publicized; employing strategies of varied forms of mass media; involving public announcement across 50 of the most populated and widely attended local churches; about 40 times repeated-announcements through the university community radio; sending of bulk text messages and electronic messages to all staff of the university using their staff E-Mails; announcement through the University of Nigeria newsletters and personal contacts. An estimated 60,000 persons were reached across periods of 14 days.

Study Group

Questionnaire development, use and administration were based on the WHO guidelines for Rabies Dog Control of 1987 (WHO, 1987). A total of fifty six (56) clients possessing one hundred and fifteen (115) patients that were vaccinated, visited the Clinic. One hundred and fifteen questionnaires/forms were distributed to clients, most of which were completed with the aid of VTH staff. Out of 115 questionnaires that were distributed only ninety eight (98) were recovered. This disparity arises from un-returned questionnaires; and some clients who own multiple patients answered with one questionnaire.

Information obtained using the questionnaire are; population and breeds uses and management of dogs; the socio-economic characteristics of these 56 clients. The client-patient relationship, described as the Clients-Patients bond (CPB), was assessed using a non-participatory close observation and in-depth interview, of clients.

The CPB, a **phrase coined by the author**, describes a subjective method of measuring the **LEVEL OF SYNC/RELATIONSHIP** between the client and his patient. CPB can be assessed in the Clinic by estimating the relationship between the client and patient(s) following their interaction within the period of their stay in the hospital. Some indicators of CPB include, but not limited to;

1. **CONTROL:** the ability of the client to command the respect of the patient, making it to be relaxed with Clinicians in the presence or absence of the clients
2. **INFORMATION:** how much up-to-date information the client has about the history, vaccination and de-worming and other general information about patient;
3. **CLOSENESS:** the ability of the client to correctly and directly answer questions about the immediate condition or disease of the patients without seeking proxy assistance
4. **ATTENTION AND CARE:** general body conformity of the animal can also suggest if patient is abandoned
5. **PAYABILITY OF CLIENT:** this suggests client's commitment to patients and willingness to pay for medications and other services. In a hospital fraught with patient abandonment and high client debt, assessing clients' pay-ability is essential.

Data Analysis

Data obtained from the study was analyzed using simple descriptive statistics by comparing means and percentages.

Results

Preliminary study on dog ownership pattern in Nsukka shows that some dogs are owned (dogs having a reference household) whereas some other dogs are not owned (dogs without a reference household, not under human supervision). However, our study was restricted to owned dogs that were presented to the VTH.

Discussions

Greater percentages of the dog owners (79%) are male because in Nsukka men are considered the owners of the home and sundry property (including the pets), although children and women are known to be the attendants to pets. Majority of clients for the campaign came from Nsukka urban followed by Udenu and the least from Igbo-Eze North, however, going by statutory hospital line list, majority of the regular

clients (50%) come from Udenu local government area. This disparity arises from improper timing, poor publicity for the free campaign program and in-efficient extension services. Furthermore, the total turn up for vaccination was low compared to estimated population of dogs in Nsukka metropolis. Hospital records reveal that most clients vaccinate their dogs at the beginning of the year; just after the Christmas break; when most clients are free to vaccinate and de-worm their dogs. Majority of the patients were of ages 3-9 months since most clients who attended the free vaccination campaign had just acquired their dogs at the beginning of the year and took advantage of the free campaign unlike older dogs that may already possess subsisting anti Rabies vaccination. All these disparities underpin the inadequacy of the statutory control and prevention strategies thus, call for more efficient strategies. There are more female than male dogs because most clients claim to keep dogs for breeding purposes (53% of patients), which has more economic benefits than security and haunting purposes. The distribution of clients according to their response time to the call differs from the distribution of patients according to their response time because one client who had more than one patient visited the Clinic more than once and also with more than one patient at a visit but all patients visited only once. This is why the total number of visits exceeds the total number of clients but less than the total number of patients. Average dog owned by a client was 3.7 dogs per client. With an estimated population of about 1 million people in Nsukka, it is probable that there are more than one million dogs in Nsukka. Generally, Nsukka is notary for breeding and exportation of dogs (particular puppies) to other parts of Nigeria. It is probable that the presence and services of the VTH is a major attraction for dog breeders in Nsukka.

There is little or no enforcement of extant laws of ownership of dogs in Nsukka. About 80 **Table**

Table 1 Distribution of Clients according to their sex

Sex	Number	Percentage
Male	44.00	78.57
Female	12.00	21.43
Total	56.00	100.00

There are more male (78.57 %) than female (21.43 %) clients (dog owners).

Table 2 Distribution of Clients regular patronage viz-a-viz participation in campaign

Local Government Area	Frequency		Percentage	
	Regular	Campaign	Regular	Campaign
Nsukka	550	47.00	30.50	83.93
Udenu	900	6.00	50.00	10.71
Igbo-Eze North	350	3.00	19.45	5.10
Total	1800	56.00	100.00	100.00

For the Campaign about 83 percent of the clients participants reside in Nsukka local government area; while 10% reside in Udenu local government area and 5% reside in Igbo-Eze North local government area. But from Hospital Line List about 50% of the Clients reside in Udenu and 30% from Nsukka

Table 3 Distribution of patients (dogs) according to sex

Sex	Number	Percentage
Male	48	35.71
Female	83	64.29
Total	115	100.00

There are more female (64.29%) than male (35.71%) patients.

Table 4 Distribution of patients according to breeds/variety of dog

Breeds of Dogs	Frequency	Percentage
Mongrel (local cross)	67	59.18
Alsatian	14	12.44
Caucasian	8	7.14
Bull Mastiff	1	1.02
Mongrel/Mixed	12	10.2
Rottweiler/Alsatian	2	2.04
Rottweiler	6	5.21
Alsatian/Caucasian	2	2.04
Caucasian/G. Shepherd	2	2.04
Terry/Alsatian	1	1.02
Total	115	100.00

About 59.18 percent of the patients are Mongrel (local) breed; with 12.44 percentage being Alsatiens; a mix of Mongrel and other breeds accounted for 10.20 percent of the total visits. Caucasian breed contributed about 7.14 percent of the total dog that visited the clinic. Breed with least population is the Terry.

Table 5 Distribution of Clients according to their ownership of more than one dog

Number of Patients	Frequency	Percentage
1-5	51	87.93
6-10	3	5.3
11-15	1	1.72
16-20	1	1.72
Total	56	100.00

About 97.93 percent of the clients visited the Clinic with 1-5 numbers of patients; whereas 5.3 percent of the clients had 6-10 numbers of patients. Average dog ownership is 3.5 dogs

Table 6 Distribution of patients according to the time of response (visit) to the call

Period of Response	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Total
	(Feb. 13-20)				(April 5-12)				
Frequency	9.00	10.00	11.00	15.00	18.00	10.00	8.00	4.00	85.00
Percentage	10.59	11.76	12.94	17.65	21.18	11.76	9.41	4.71	100.00

The greatest number of clients visited the VTH during Week 5, with 21.18%; week 4 with 17.65% followed by week 3, with percentage 12.94. Weeks 2 and 6 had the same percentages of 11.76 each.

Table 7 Distribution of Dogs according to Supervision

Supervision	Frequency	Percentage
Supervised	79	68.4
Roam	36	31.6
Total	56	100.00

About 80 percent of the dogs in Nsukka are allowed to continuously roam freely with the other 20 percent drifting between obligate caged and dogs that roam at night and return home in the morning.

Table 8 Distribution of patients according to sex and age in months

Sex	3-9 Months		>9-15 Months		>15-21Months		>21-27 Months		>27-33 Months		>33-39 Months		> 39 Months		Total
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	
Male	25.00	25.50	2.00	2.04	0.00	0.00	1.00	1.02	0.00	0.00	4.00	4.08	3.00	3.06	
Female	43.00	43.88	7.00	7.14	3.00	3.06	5.00	5.10	0.00	0.00	1.00	1.02	4.00	4.08	
Total	68.00	69.38	9.00	9.18	3.00	3.06	6.00	6.12	0.00	0.00	5.00	5.10	7.00	7.14	

NB: lowest age is 3 months because ARV vaccination in dog commences only after dog has reached 3 months of age Table 8 above about 69.38 percentage of the dogs, in both male and female are within the age range of 3-9 months old. Age ranges of >9-15 months had 9.18 percent; ages >21-27 months had 6.12 percent and age range >39 months had 7.14 percent.

Table 9 Distribution of clients according to their use of the patients

Use of Patients	Frequency	Percentage
Pet only	6	5.22
Security only	10	8.70
Haunting only	6	5.22
Breeding only	62	53.90
All four Purposes	42	36.52
Other Purposes (Research)	36	31.31
Total no of dogs	115	

Source: Hospital Line List

Majority of the dogs (53.90%) are kept for economic reasons of breeding and this explains the high percentage (83%) of female dogs. Dogs are rarely (5.22%) kept as pets only; these are usually exotic breeds, like the Terry/Alsatian cross.

percent of the dogs in Nsukka are allowed to continuously roam freely with the other 20 percent drifting between being obligately caged and dogs that roam at night and return home in the morning. Allowing dogs to roam and scavenge has been closely linked to poverty. This further buttresses the author's earlier claim, in a related study, that dogs stray in Nsukka, an area endemic for Rabies (Uchendu et. al., 2012). There are records of series of dog bites (dog-to-dog or dog-to-man) by stray dogs or pet/security dogs, which had been ignored or un-reported (Uchendu, et. al., 2012).

The socio-economic status of the clients, as extracted from existing Clinic records shows a direct correlation with the breed of dogs, uses of dogs as well as the healthiness of their pets. Most clients who lived in the rural areas of Nsukka; usually below poverty line, owned local breeds, which served either for haunting or security, whereas clients who lived at the urban areas of Nsukka owned exotic dogs, which served for pets and security purposes. Assessment of Clients-Patients bond (CPB), using a non-participatory close observation and in-depth interview, of clients reveals that exotic breeds, which were mostly owned by the elite class were more amenable to control. These set of clients unlike their non-elite counterparts demonstrated higher ability to pay, which was evident in their scores on closeness with, care

and attention to, and up-to-date knowledge of their dogs.

Furthermore, it was observed that the temperament of the clients corresponded with the temperaments of their dogs. This is an interesting area in animal psychology and highly recommended for further investigation.

Conclusion/Recommendations

The campaign brought increased visibility of the Veterinary Teaching Hospital to the Nsukka metropolis with attendant increase uptake of other products and services of the hospital. There is little or no enforcement of extant laws of ownership of dogs as prevalence of stray dogs and dog bites are high in Nsukka. The Director of Veterinary Services should enforce the extant laws for dog ownership. Since most clients vaccinate their dogs during the Christmas and New Year periods, it is therefore recommended that subsequent free anti Rabies vaccination campaigns should synchronize with this period in order to accommodate more dog owners. Further studies on the risk factors, reasons for non-adherence to extant laws of dog ownership and demographic distribution of stray dog bites and possible traditional management methods in Nsukka are recommended.

References

1. Anthea, M., Hopkins, J., Charles, W. M., Johnson, S., Warner, M. Q., Lattart, D. and Wright, J. O.

- (1993). Human Biology and Health. Eaglewood Cliffs, New Jersey, USA: Practice Hall. Pp132-144 available online at <http://en.wikipedia.org/wiki/centralnervoussystem.html>
2. Cotran, R. S., Kumar, V. Fausto, N., et. al., (2005) In: Robbins and Cotran, R. S. (editors), Pathologic Basis of Disease (7th Ed.) St. Louis: Elsevier/ Saunders. Pp.1375. ISBN 0-7216-0187.1. Available online at <http://en.wikipedia.org/Rabies>
 3. Drew, W. I., (2004). Rabies. In Ryan, K. J., Ray, C. G. (editors). Sherris Medical Microbiology, 4th ed., McGraw Hill. Pp597-600. ISBN 0-8385-8520-9. Available online at <http://en.wikipedia.org/Rabies>
 4. Durr S, Naissenger S. Mindekem R. (2008). Rabies: diagnosis for developing countries. PLOS Neglected Tropical diseases, 2 (3): e206. Doi: 101371/journal.pntd.0000206. PMC2268742. PMID18265035.
 5. Kienzle, T. E (2007). Deadly Disease and Epidemics-Rabies. InfoBase Publishing Chelsea House Publishers
 6. NBS (National Bureau of Statistics), Nigeria (2012). Economic performance review April/July 2011. Federal Republic of Nigeria, Abuja, Nigeria
 7. Rasitorahina, M., Rasambainarivo, J. H., Raharimanana, S., Rakotonanadrasana, H., Andriamiarisoa, M. P., Rakalomanana, F. A., and Richard, V., Dog ecology and demography in Antananarivo, 2007. BMC Veterinary Research 2009, 5:21doi10.1168/1746-6148-5-21. Available Online at <http://www.biomedcentral.com/1746-6148-5-21>. Retrieved on February 4, 2016
 8. Uchendu, G. C., Daniel-Igwe, G., Eze. C. A., (2012) A case of Rabies in a 5 Month Old Male Dog presented at the University of Nigeria Veterinary Teaching Hospital, Nsukka, Nigeria. Journal of Veterinary and Applied Sciences, Faculty of Veterinary Medicine, University of Nigeria, Nsukka. Vol. 2 (1) 41-44.
 9. Voice of America (2009). New Rabies Vaccine Shows: Promise for Prevention, Treatment. Voice of America. 2009-07-08. Available at <http://www.voanews.com/english/archive/2009-07/2009-07-08.0a62.cfm?> Retrieved 2011-03-27. CDC (Centers for Disease Control) (2009). Rabies: Post-Exposure Prophylaxis. CDC. 2009-12-23. <http://www.cdc.gov/rabies/exposure/postexposure.html>. Retrieved 2010-01-30
 10. World Health Organization: *Guidelines for dog rabies control* WHO document VPH/83.43: Rev.1. World Health Organization, Geneva, Switzerland; 1987.
 11. WHO (World Health Organization) (2010) Rabies. Available at <http://www.who.int/medicentre/factsheet/fs099/en/>
 12. Headey B: Pet ownership: good for health? *Medical Journal Of Australia* 2003, 179(9):460-461.
 13. McNicholas J, Gilbey A, Rennie A, Ahmedzai S, Dono JA, Ormerod E: Pet ownership and human health: a brief review of evidence and issues. *BMJ* 2005, 331(7527):1252-1254.
 14. Friedmann E: The role of pets in enhancing human well-being: physiological effects. In *The Waltham Book of Human-Animal Interaction: Benefits and Responsibilities of Pet Ownership* Edited by: Robinson I. Oxford , Elsevier Science Ltd; 1995:33-53.
 15. Katcher AH, Friedmann E: Potential health value of pet ownership. *California Veterinarian* 1982, 36:9-13.
 16. Katcher AH: Interactions between people and their pets: form and function. In *Interrelations between people and pets* Edited by: Fogle B. Springfield , Charles C. Thomas; 1981:41-67.
 17. Heady B, Grabka M, Kelley J, Reddy P, Tseng Y: Pet ownership is good for your health and saves public expenditure too: Australian and German longitudinal evidence. *Australian Social Monitor* 2002, 4:93-99.
 18. Friedmann E, Katcher AH, Lynch JJ, Thomas SA: Animal companions and one-year survival of patients after discharge from a coronary-care unit. *Public Health Rep* 1980, 95(4):307-312.
 19. Endenburg N, Baarda B: The role of pets in enhancing human well-being: effects on child development. In *The Waltham Book of Human-Animal Interaction: Benefits and Responsibilities of Pet Ownership* Edited by: Robinson I. Oxford , Elsevier Science Ltd; 1995:7-17.
 20. Burch MR, Bustad LK, Duncan SL, Frederickson M, Tebay J: The role of pets in therapeutic programs. In *The Waltham Book of Human-Animal Interaction: Benefits and Responsibilities of Pet Ownership* Edited by: Robinson I. Oxford , Elsevier Science Ltd; 1995:55-69.
 21. Greene CE, Levy JK: Immunocompromised people and shared human and animal infections: zoonoses, sapronoses and anthroponoses. In *Infectious Diseases of the Dog and Cat* Third edition. Edited by: Greene CE. St. Louis, Missouri , Saunders Elsevier; 2006:1051-1068.

