

Epidemiology of health problems in dogs

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ABSTRACT

In this study, we describe the epidemiology of the health problems in dogs brought to the National Animal Referral Hospital in Thimphu city from January 2009 to December 2013. During the period, a total of 5077 dogs with different health problems were referred to the hospital. Maximum number of cases were skin problems (30.7%), followed by GI tract disorders (18.6%), wound and abscess (8.9%), Parvo-Viral Enteritis (7.3%), animal welfare problems (dog bite wound – 6.0%, and injury due to running vehicles – 3.5%) and canine distemper (5.4%). A total of 273 canine distemper cases were presented to NAH, which constituted 5.4% of the total cases brought to the hospital. The prevalence of CD was highest in 2009 followed by 2011 and 2013. The CD cases were reported throughout the year with maximum cases reported in the month of July and September. Similarly, a total of 373 cases of PVE were presented to NAH, which represented 7.3% of the total cases. The prevalence of PVE was highest in 2009 followed by 2012. The PVE cases were presented throughout the year with the higher prevalence in the spring and early summer (March to June). Dog bite wound and injury due to running vehicles constituted 6.0% (305/5077) and 3.5% (180/5077) of the total cases presented to NAH, respectively. The prevalence of animal welfare problems in male dogs (12.0%) was higher than in the female dogs (8.6%). Similarly, the prevalence of animal welfare problems was higher in stray dogs than in the owned dogs. An increasing trend in the prevalence of animal welfare problems was noticed from 2009 to 2013 with the higher incidence of animal welfare problems in the month of April and May; and from September to December. The findings of this study provide useful information for preparing the drug indent (based on the disease information), which would help to reduce the wastage of drugs. The dog owners should be sensitized on the importance of vaccinating their dogs on common infectious diseases such as CD and CPV on a regular basis.

INTRODUCTION

The dog was the first species to be domesticated, most likely at least 14,000 to 15,000 years ago (Clutton-Brock 1995; Stafford 2006). Dogs perform lots of useful function such as pets and companion, as guard dogs, for hunting, draught animals and for other specialized purposes (Murray and Penridge 1992; Coppinger and Schneider 1995). People owning dogs are much happier and healthier and the recent evidence suggests that pet owners visit their doctors less frequently, use fewer medications and have lower blood pressure and cholesterol levels than those who do not own pets (Blackshaw 1996). In Bhutan, dogs are kept mainly as pets and companion animals in the urban areas and for guarding the crops, premises and for herding the livestock in rural areas (Rinzin 2015).

In the past, most of the owned dogs were local breeds but nowadays there has been an increase in the number of exotic breeds. Over the years more and more people are keeping dogs as pets and companion in the urban areas which is evident from the registration records maintained at the National Animal Hospital (NAH), Chubachu, Thimphu and other Animal Health Facilities (NAH, 2012). The NAH, Chubachu registered 4,257 dogs from 2007 to 2011 in the Thimphu Municipal area (NAH, 2012). Of the total owned dogs 1,526 (36%) were foreign breeds (24 different breeds) with Alsatian being the most common of these in Thimphu. The local breeds registered in

the Thimphu Municipal area were *Lhasa Apso* (729), *Jobchi - Mastiff* (617), *Damtsi* (414) and other local breeds (971).

The Livestock Rules and Regulations 2008 has a section on responsible pet ownership where the dog owners are required to register, vaccinate, sterilize and confine the dogs in addition to other requirements (MOAF 2008). However, compliance to these regulations on responsible pet ownership is poor because of which owned dogs significantly contributes to increase in free-roaming dog population through haphazard breeding and abandonment of puppies. This lead to increase in number of dog bite cases and incidence of zoonotic disease such as rabies, echinococcosis, leishmaniasis and toxacariasis. Although there are no reported cases of rabies in dogs in Thimphu for the past few decades, rabies is still endemic in the southern border Dzongkhags (Talan et al. 2006; Tenzin et al. 2010; Tenzin et al. 2011a; Tenzin et al. 2011b). There was an unexpected incursion of rabies in Haa which was in a dog illegally imported from Siliguri, India. There was also report of wildlife being attacked by the dogs and displacing them from their normal habitats. To address the over population of dogs in the country, the Department of Livestock in collaboration with the Humane Society International initiated capture-neuter-vaccinate-release (CNVR) programme in the country and CNVR campaigns are be carried out in Thimphu Thromde on an annual basis (DOL/HSI 2009).

Increasing free-roaming dog population also causes welfare issues to the dogs through fights among themselves which is

further aggravated during the breeding season. Dogs also become the victims of increasing road traffic and people which inflicts injury to the dogs. This welfare issues are not only restricted to the un-owned stray dogs but owned dogs also frequently become the victims as most of them are not confined by their owners. Besides the injury, there are other health problems in dogs which include infectious diseases such as canine distemper, parvoviral infection as well as other common health problems such as gastrointestinal disorders and skin problems (Kahn and Line 2014b; Kahn and Line 2014a). However, not a single study on the health problems in dogs was carried out in Bhutan. Therefore, the study on epidemiology of health problems in dogs presented to the National Animal Hospital, Thimphu between 2009 to 2013 was conducted with the four main objectives. The first objective was to find out the overall incidence or prevalence of the common health problems in dogs. The second objective was to find out the prevalence of canine distemper and parvovirus infection in dogs. The third objective was to understand the common welfare issues in the dogs. The fourth objective was to rationalize the drug indent based on the epidemiology of the health problems.

MATERIAL AND METHODS

Study area

The National Animal Hospital (NAH) is government run hospital established in 1960s to provide veterinary clinical services and function as national apex body for the clinical veterinary services in the country. As a national apex body for the clinical veterinary services, the recent Organizational Development Exercise (ODE) mandates NAH to function as a national referral hospital and competent centre for clinical veterinary services in the country; to support development of policies, strategies and plans for animal health; plan, coordinate, monitor and evaluate clinical veterinary services; support research on animal health; function as an institute for capacity development in clinical veterinary services; and act as pharmacovigilance centre for veterinary drugs. However, at present, due to lack of specialist manpower and facilities, the mandates given to NAH could not be realized fully and services provided currently are mainly within Thimphu Thromde area. Nevertheless, Government is in the process of strengthening NAH in terms of infrastructure, facilities and human resource development (HRD).

Clinical data collection

The clinical cases that were presented to NAH from January 2009 to December 2013 were extracted from the animal treatment register and pet registration database/ register. Data relative to age, sex, breed, owner status and diagnosis were collected. Breed of dogs was broadly categorized into two groups i.e. Local and Foreign breeds

Analysis was carried on the canine cases presented to NAH during the study period. Descriptive epidemiological analysis was carried out for the important health problems such as canine distemper, parvo-viral enteritis, skin disease and wound inflicted by dog bites and accidents (welfare problems). We have used the following case definition for the important health problems reported in this study.

Canine distemper (CD) - A dog of any age group showing clinical signs of diarrhea, vomiting, ocular/nasal discharge, nervous signs and not vaccinated against distemper virus.

Parvo-viral enteritis (PVE)- A young dog (age below 1 year) showing clinical signs of foul smelling bloody diarrhoea, vomiting and not vaccinated against PVE.

Skin disease- A dog of any age group with inflammation of skin characterized by itchiness, red skin, rash, alopecia and

scratching uncontrollably. The area of skin involved can vary from small to entire body.

Welfare problems - A dog of any age group presented to NAH with the wound caused by dog bites and any injury caused by running vehicles.

Data analysis

Analyses were performed on data of 5077 dogs presented to NAH from January 2009 to December 2013, which had individual records of their sex, age, breed, owner status and diagnosis. The record of age and gender was not available for the year 2009 and 2010 and analysis relative to age and sex was carried out for the period January 2011 to December 2013.

Analyses were done using Microsoft Excel (Microsoft Excel 2010, Redmond, USA) and Statistical software R (R Development Core Team, 2013). On the basis of diagnosis, the cases were broadly categorized into 16 types. Descriptive statistics were performed and prevalence (proportion) of the different health problems were estimated by using the total canine cases presented to NAH during the study period as denominator and 95% CI for proportions were calculated using the exact binomial method (Ross 2003). Bivariable analyses were performed using χ^2 tests to compare the prevalence of health problems between different ages, genders, breeds and owners.

RESULTS

Overall health problems

From January 2009 to December 2013, a total of 4,157 dogs were brought to NAH and registered as pets by their owners. Pet dogs were dewormed and vaccinated at the time of registration. Similarly, 5,077 dogs (5016 owned dogs and 61 stray dogs) were presented to the hospital with various health problems during the study period. Table 1 shows the number of different types of health problems and the proportion each contributed to the overall health problems. Maximum cases presented to the hospital were skin problems (30.7%) followed by GI tract disorders (18.6%), wound and abscess (8.9%), Parvo-Viral Enteritis (7.3%), animal welfare problems (dog bite wound – 6.0%, and car accident wound – 3.5%) and canine distemper (5.4%).

Prevalence of canine distemper (CD)

During the study period, a total of 273 canine distemper (CD) cases were presented to NAH, which constituted 5.4% of the total cases brought to the hospital (Table 1). The results of the bivariate analyses of the population characteristics of the dogs associated with CD are presented in Table 2. The prevalence of CD in younger dogs (puppies 4.6% & juvenile 7.9%) was higher than in the older dogs (adult 3.9%) which was statistically significant ($p \leq 0.05$). The prevalence was significantly lower in foreign breeds (2.7%) than the local breeds (6.4%). The prevalence of CD was significantly higher in stray (13.1%) than in owned dogs (5.3%). The prevalence of CD was highest in 2009, followed by 2011 and 2013 (Figure 1). Very few cases of CD were reported in year 2010 and 2012. The CD cases were reported throughout the year with maximum cases reported in the month of July and September (Figure 2).

Prevalence of Parvo-viral enteritis (PVE)

A total of 373 cases of PVE were presented to NAH, which represented 7.3% of the total cases. The results of the bivariate analyses of the population characteristics of the dogs associated with PVE are presented in Table 3. The prevalence of PVE in

younger dogs (puppies 14.0% & juvenile 7.5%) was higher than in the older dogs (adult 2.3% & aged 0.7%), which was statistically significant ($p \leq 0.05$). The prevalence of PVE was highest in 2009, followed by 2012 and with minimum prevalence in 2013 (Figure 1). The PVE cases were presented throughout the year with the higher prevalence in the spring and early summer (March to June) (Figure 2).

Table 1 Proportion of health problems presented at National Animal Hospital, Thimphu from 01 January 2009 to 31 December 2013.

Health problems	Number of cases	Prevalence (95% CI)
Canine Distemper (CD)	273	5.4 (4.77 - 6.03)
Automobile accident	180	3.5 (3.05 - 4.09)
Dog bite wound	305	6.0 (5.37 - 6.70)
Ear and eye affections	169	3.3 (2.85 - 3.86)
GI tract disorders	946	18.6 (17.57 - 19.73)
Musculoskeletal problems	131	2.6 (2.16 - 3.05)
Nervous disorder	83	1.6 (1.30 - 2.02)
Nutrition and metabolism	70	1.4 (1.08 - 1.74)
Oral affections	8	0.6 (0.07 - 0.31)
Pain and inflammation	107	2.1 (1.73 - 2.54)
Parvo-Viral Enteritis (PVE)	373	7.3 (6.64 - 8.10)
Respiratory tract affections	259	5.1 (4.51 - 5.74)
Skin problems	1559	30.7 (29.44 - 32.00)
Tumor	128	2.5 (2.11 - 2.99)
Urogenital affections	34	0.7 (0.46 - 0.93)
Wound and abscess	452	8.9 (8.13 - 9.72)
Total	5077	100

Prevalence of skin problems

The skin problems in dogs constituted 30.7% (1559/ 5077) of the total cases presented to NAH (Table 1). The results of the bivariate analyses of the population characteristics of the dogs associated with skin problems are presented in Table 4. High prevalence of skin problems was observed in all age groups with maximum prevalence in adult dogs, followed by aged, juvenile and puppies. The prevalence of skin problems was higher in local breed than foreign breed dogs; and in stray than owned dogs, which was statistically significant ($p \leq 0.05$).

The prevalence of skin problems was highest in 2009, followed by 2010 (Figure 1). Higher prevalence of skin problems was seen throughout the year without any seasonal trend (Figure 2).

Prevalence of animal welfare problems (dog bite wound and automobile accidents)

The number of dog bite wound and automobile accident cases were presented to NAH during the study period. Dog bite wound and injury due to running vehicles constituted 6.0% (305/5077) and 3.5% (180/5077) of the total cases presented to NAH, respectively (Table 5). These two problems were grouped together as animal welfare problems, which constituted 9.6% of the total cases brought to the hospital. The results of the bivariate analyses of the population characteristics of the dogs associated with animal welfare problems are presented in Table 5. The prevalence of animal welfare problems in male dogs (12.0%) was higher than in the female dogs (8.6%), which was statistically significant ($p \leq 0.05$). Similarly, the higher prevalence of animal welfare problems was observed in stray dogs (31.1%) compared with the owned dogs ((9.3%); ($p \leq 0.05$)). There was no significant difference in the prevalence of CD amongst foreign and local breeds, and within different age groups.

Table 2 Descriptive data and analyses of population characteristics of dogs associated with canine distemper.

Variables	Canine Distemper		χ^2	df	Sig.
	No (%)	Yes (%)			
<i>Age^β</i>					
Puppy	95.4	4.6	14.68	3	0.002
Juvenile	92.1	7.9			
Adult	96.1	3.9			
Aged	100.0	0.0			
<i>Gender</i>					
Female	96.4	3.6	3.56	1	0.06
Male	94.9	5.1			
<i>Breed^β</i>					
Foreign breed*	97.3	2.7	25.54	1	<0.001
Local breed [^]	93.6	6.4			
<i>Owner status</i>					
Owned	94.7	5.3	7.27	1	<0.001
Stray	86.9	13.1			

*Note: Foreign breed include 20 different types of breeds

[^]Local breed include non-discrete local, Mastiff, Damchi and Apsoo

^βDetail of age and breed was missing for the year 2009 and 2010.

Table 3 Descriptive data and analyses of population characteristics of dogs associated with PVE.

Variables	Parvo-viral enteritis (PVE)		χ^2	df	Sig.
	No (%)	Yes (%)			
<i>Age^β</i>					
Puppy	86.0	14.0	132.9	3	<0.001
Juvenile	92.5	7.50			
Adult	97.7	2.30			
Aged	99.3	0.70			
<i>Gender</i>					
Female	94.4	5.60	1.47	1	0.22
Male	93.3	6.70			
<i>Breed^β</i>					
Foreign breed	92.5	7.50	0.17	1	0.72
Local breed	92.7	6.30			
<i>Owner status</i>					
Owned	92.6	7.40	0.54	1	0.46
Stray	95.1	4.90			

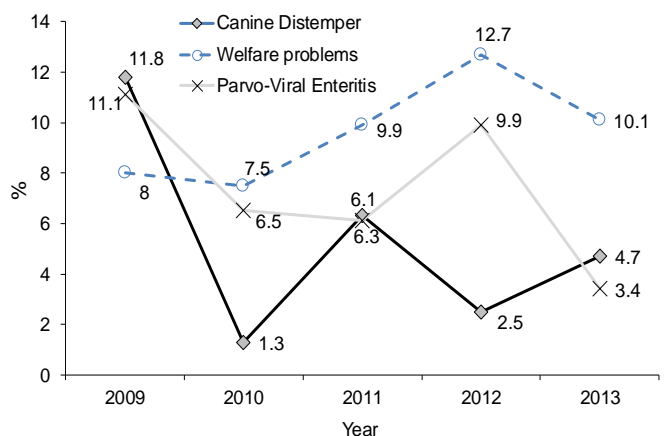


Figure 1 Year wise prevalence of health problems in dogs.

An increasing trend in the prevalence of animal welfare problems was noticed from 2009 to 2013 (Figure 1). Higher incidence of animal welfare problems was seen in the month of April and May; and from September to December (Figure 2).

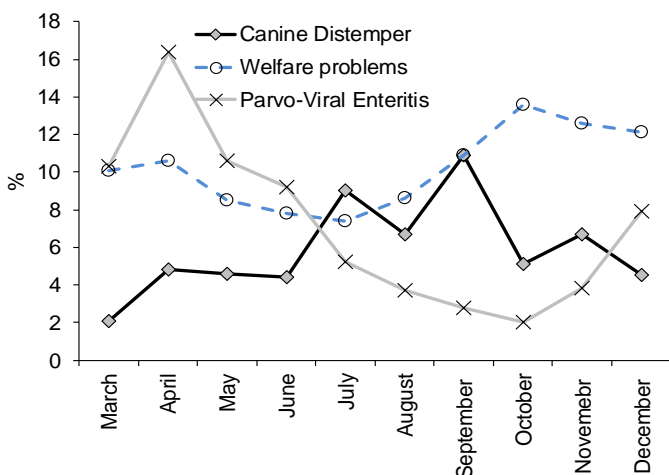


Figure 2 Month wise prevalence of health problems (CD, PVE, Welfare problems) in dogs from 01 January 2009 to 31 December 2013.

Table 4 Descriptive data and analyses of population characteristics of dogs associated with skin problems.

Variables	Skin problems		χ^2	df	Sig.
	No (%)	Yes (%)			
<i>Age^β</i>					
Puppy	80.0	20.0	43.84	3	<0.001
Juvenile	72.0	28.0			
Adult	67.3	32.7			
Aged	71.7	28.3			
<i>Gender^β</i>					
Female	70.4	29.6	3.88	1	0.487
Male	73.7				
<i>Breed</i>					
Foreign breed*	71.7	28.3	5.217	1	0.022
Local breed [^]	68.4	31.6			
<i>Owner status</i>					
Owned	69.4	30.6	4.12	1	0.042
Stray	57.4	42.6			

*Note: Foreign breed include 20 different types of breeds

[^]Local breed include non-discrete local, Mastiff, Damchi and Apso

^βDetail of age and breed was missing for the year 2009 and 2010.

DISCUSSION

This study highlights different health problems in dogs that were presented from January 2009 to December 2013. Among the various health problems, the occurrence of skin problems in dogs was found to be the highest (30.7%). This is much higher than the similar study undertaken in small animal clinic at the University of Montreal in Canada with the prevalence of 18.8% (Scott and Paradis 1990). The lower incidence in the Canadian study could be due to good care and management of dogs by the owners than the Bhutanese owners. Skin problems have several causes of which the common ones are ectoparasite infestation and allergy. In this study, we did not try to find out the specific cause of skin problems. Higher proportion of the male dogs have skin problems compared with the female dogs. This may be due to more movement of male dogs from the

Table 5 Descriptive data and analyses of population characteristics of dogs associated with animal welfare problems (dog bite and automobile accident wounds).

Variables	Animal welfare problems		χ^2	df	Sig.
	No (%)	Yes (%)			
<i>Age^β</i>					
Puppy	91.4	8.60	4.17	3	0.243
Juvenile	89.1	10.9			
Adult	89.4	10.6			
Aged	87.0	13.0			
<i>Gender</i>					
Female	91.4	8.6	8.48	1	0.003
Male	88.0	12.0			
<i>Breed^β</i>					
Foreign breed*	91.6	8.4	2.64	1	0.104
Local breed [^]	90.0	10.0			
<i>Owner status</i>					
Owned	90.7	9.30	33.32	1	<0.001
Stray	68.9	31.1			

owners' residence and premises and mixing with other dogs. The prevalence of skin problems was lower in owned dogs than the stray dogs as the owned dogs are usually provided with the skin care therapy or given ivermectin injection to prevent and control ectoparasites. An effort should be made by the owners to prevent ectoparasitic infestation of their dogs by proper management and regular visit to the hospital. The other common health problem presented to NAH is Gastro-intestinal tract disorder, which may be due to dogs not being dewormed or due to improper feeding of the dogs (Kahn and Line 2010). Therefore, the owners should be educated on the balance feeding so that their dogs receive all the essential nutrients as well as on the importance of regular deworming of their dogs.

Every year there were reports of CD and PVE cases to NAH. The prevalence of CD and PVE is lower in older dogs as the older dogs must have acquired the immunity through either vaccination or natural exposure (Gemma et al. 1996; Kahn and Line 2014b; Kahn and Line 2014a). Similarly there are lower prevalence of CD in foreign breed dogs as the owners are more likely to vaccinate the foreign breed dogs compared with the local dogs. Likewise the prevalence of CD in stray dogs are higher as the stray dogs are not vaccinated against CD unlike the owned dogs. Although some of the owners use five in one (Distemper, Hepatitis, Parvovirus, Para-influenza and Leptospirosis - DHPPi+L) vaccine to vaccinate their dogs, its usage is still very low, which may be either due to high costs or poor awareness of the owners. Therefore, owners should be made aware of the important infectious diseases as well the benefits of giving such combined vaccines to their dogs.

The increasing trend in animal welfare problems has been noticed over the years. This may be due to increase in number of vehicles and traffic congestion in Thimphu city. The other reason could be due to Buddhist belief of earning good karma by taking care of the injured dogs whereby public volunteer to take ailing dogs to the hospital for treatment (Rinpoche 1993; Choden 2006). Although animal welfare problems are reported throughout the year, higher incidences are observed in the month of March and April and from September to December. This coincides with the peak mating season for the dogs where male dogs frequently fight and compete for the female dogs that are in heat, resulting in higher incidences of animal welfare problems (Rinzin 2015). Higher proportions of male dogs are confronted with welfare problems, which may be due to frequent roaming habits of male dogs who move around either

in search of food or female dogs in heat during the mating season. There is no significant difference in prevalence of animal welfare problems in foreign and local breed dogs. This shows that Bhutanese dog owners do not confine the dogs although there is a provision in livestock rules and regulations to confine the dogs. The study undertaken to understand the demography of owned dogs in Gelephu and Phuentsholing showed that about 40% of the owned dogs are not confined or free-roaming (Rinzin et al. 2016). Therefore, education of dog owners on responsible pet ownership and regular monitoring of their compliance should be provided by Department of Livestock (DoL) and Bhutan Agriculture and Food Regulatory Authority (BAFRA). In order to reduce the problems due to increasing dog population and to reduce the animal welfare problems, animal birth control of both owned and stray dogs should be regularly carried out in collaboration with the relevant stakeholders.

All the dogs that were classified as owned dogs may not be owned as some of the ailing dogs picked up from the street by the public may be also included as owned. The information on age and sex of dogs was not available in the first two years of the study period (2009 to 2010). Therefore, analysis relative to age and gender was done only for the remaining three years of the study period (2011 to 2013). On the other hand, analysis relative to breed and owner status included the entire five-year study period from 2009 to 2010. The diagnosis of the health problems were based on clinical manifestation and assessment by the veterinarians without laboratory confirmation. In order to carry out the detail analysis of the health problems, detail information related to age, sex, breed, owner status, health status, owner address and diagnosis should be captured following standard operating procedures (SOP) for the veterinary clinical services. In the long run, all the detail demographic characteristics and other information pertaining to the health problems should be captured in the reliable clinical pathway database. The rapid diagnostic kits for diagnosis of common infectious diseases such as CD and PVE should be used to confirm the disease.

CONCLUSIONS

This is the first study on the epidemiology of health problems in dogs in Thimphu city. The findings of this study provide basis for proper and realistic indenting of veterinary medicines and vaccines for NAH based on the epidemiology of the health problems which would help in reducing the drug wastage. Considering the number of benefits from owning dogs, the owners should be aware of their roles as a responsible pet ownership, which include registration, vaccination, sterilization providing of food, water, shelter and fulfilling the physiological and psychological needs of the dogs. The availability of combined vaccines (DHPPi+L) against number of infectious diseases should be made known to the owners. Aggressive education of dog owners on responsible pet ownership should be pursued by DoL and BAFRA as most of the health problems in dogs can be addressed through strict implementation of responsible pet ownership. In order to reduce the problems due to increasing dog population and to reduce the animal welfare problems, animal birth control of both owned and stray dogs should be regularly carried out in collaboration with the relevant stakeholders.

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