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Retrospective study of disease incidence and other clinical conditions diagnosed in owned dogs in Delta State, Nigeria

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ABSTRACT

In Nigeria, knowledge on the epidemiology of diseases of dogs is limited. A retrospective study of data from clinical records of six veterinary clinics was undertaken to determine the incidence of disease in owned dogs in Delta State, Nigeria from 2012 to 2014. Association between the diagnosed diseases and the studied variables was explored using Chi-Squared test statistics. This study revealed that most of the conditions presented to the veterinary clinics were preventable. Thirty-one (31) clinical conditions were diagnosed from 571 cases recorded, involving nonspecific (21.6%), infectious (70.9%; *P*=0.001) and non-infectious (7.5%) diseases. The most occurring clinical conditions comprised helminthoses (21.4%), mange (10.5%), parvovirosis (8.4%), babesiosis (7.9%), septicemia (7.2%), gastroenteritis (7.0%), myiasis (7.0%), trauma (6.3%), poisoning (6.0%), ectoparasitism (3.7%), ascites (2.5%), dermatitis (2.3%), aural hematoma (1.2%), and orchitis (1.1%). Disease incidence was highest in Alsatian (40.3%), mixed/cross (33.1%), Rottweiler (7.0%) and toy breeds (4.6%). Details on the least occurring diseases and the association between disease and the studied variables are given. The outcomes demonstrate the prevalence of the clinical conditions diagnosed, inadequate husbandry and veterinary care accorded to owned dogs in the State. Education of dog owners on preventive measures is paramount in alleviating some of these health problems.

Keywords

Clinical records, Epidemiology, Dog, Disease, Control, Nigeria

ARTICLE HISTORY

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INTRODUCTION

Dogs are one of the most important domestic animals seen in almost every human settlement globally. They are kept to perform valuable roles in the society. In Nigeria, people keep them as pets, guard dogs, for hunting, breeding, as well as a source of animal protein among some ethnic groups (Aiyedun and Olugasa, 2012; Hambolu et al., 2014). In Delta State, they are kept mostly by households as pets, guard dogs, hunting, as a source of livelihood or commercial gains by breeders, and by companies to assist in facility surveillance, while some group of individuals in the State cherishes dog meat as a delicacy.

Several diseases and clinical conditions that adversely affect the health of domesticated animals threaten dogs alike. Dog keeping is associated with certain responsibilities including the provision of shelter, nutrition, good health care, disease management, as well as protecting humans from zoonotic diseases associated with it (Craig and MacPherson, 2000).

There are reports on clinical conditions of dogs in Nigeria, most of which are obsolete. A limited number of such reports focused on the profile of clinical conditions of owned dogs (William et al., 2002; Okusanya et al., 2014) while many concentrate on specific rather than study the diseases in a group. For instance, Mohammed et al. (2005) investigated the risk factors for canine parvovirus infection in Vom, Nigeria.

Others include ascites (Ihedioha et al., 2011), earfly bite wounds (Akinrinmade and Akinrinde, 2013), zoonotic and non-zoonotic gastrointestinal helminths of dogs (Onyenwe and Ikpegbu, 2004; Odeniran and Ademola, 2014), and haemo- and gastrointestinal parasites (Pam et al., 2013). Again, tick-transmitted pathogens of dogs (Kamani et al., 2013; Adamu et al., 2014) including canine babesiosis (Ogo et al., 2011), common causes of poisoning and mortality in owned dogs (Shima et al., 2014; 2015a), and rabies (Ajayi et al., 2006; Adedeji et al., 2010) among others have been studied. Studies have also shown that most dog owners have insufficient knowledge and poor perceptions regarding dog-transmitted zoonoses (Ugbomoiko et al., 2008; Odeniran and Ademola, 2014; Hambolu et al., 2014). Additional studies reported that a fraction of dog owners who vaccinated their dogs, especially against rabies is below the satisfactory 70-80% target recommended by the World Health Organization to achieve herd immunity (Dzikwi et al., 2011; Hambolu et al., 2014). This may be credited in part to the limited access or absence of veterinary services in most communities in Nigeria, awareness issues, the cost of vaccines and veterinary labor, as well as lack of strict laws governing animal welfare and ownership.

A good knowledge of the epidemiology of diseases of dog is important for their prevention or control. In Nigeria however, there is an inadequate knowledge about these diseases. A myriad of diseases or clinical conditions especially parasitic diseases such as gastrointestinal helminthes and protozoan parasites are major known health challenges to dogs globally (Smith, 1991). Some of the common conditions of owned dogs include heminthoses, babesiosis, canine distemper, canine parvovirus enteritis, leptospirosis, and respiratory conditions among others (Okusanya et al., 2014) with the zoonotic ones serving as potential threats to humans and other domesticated animals. As an example, dogs are a source of human rabies and domestic transmission of rabies through bites of rabid dogs (Dedmon, 2008). Dogs are reckoned as the principal vector and reservoir of rabies in Africa (Cleaveland et al., 2007). Again, they form an important reservoir for the transmission of parasites including toxocariasis, echinococcosis, diphyllobothriasis, thelaziasis, spirocercosis, filariasis, and a host of others to man (Ugbomoiko et al., 2008; Kutdang et al. 2010; Odeniran and Ademola, 2014).

In Nigeria, most dogs are owned but some people raise them as free-ranging dogs or allow them to stray. The free-ranging and stray dogs are considered as the most important in zoonotic diseases transmission in Nigeria owing to several factors including low veterinary care accorded to dogs (Olugasa et al., 2011; Magaji et al., 2012; Eke et al., 2015). Priority dog-transmitted zoonoses in the country include rabies, echinococcosis, toxocariasis, ancylostomosis, etc. (William et al., 2002; Odeniran and Ademola, 2014; Hambolu et al., 2014). In the tropics, zoonotic helminths of dogs are major threats to humans. The groups most vulnerable to these zoonotic infections are children, immuno-compromised patients and dog keepers who often have contacts with these pets. In addition, ectoparasites such as ticks also play major roles in the epidemiology of diseases in humans and animals worldwide.

The population of dogs in Nigeria at present is unknown. However, Delta State, the studied location (**Figure 1**) appears to have a substantial dog population and growth with many of them located in the urban areas. The State is an oil and agricultural producing area situated in the south-south geopolitical zone of Nigeria. Its capital is Asaba while Warri is its economic or commercial nerve centre. It has a tropical climate marked by two distinct seasons, dry (November-March) and rainy (April-October) seasons. The State experiences copious rainfalls with a fluctuating climate, ranging from humid to the sub-humid climate in the south to northeast, respectively. The decrease of the humid climate towards the north is accompanied by an increasing marked dry season. The average rainfall is about 266.5 mm in the coastal areas and 1905 mm in the extreme north. Temperature increases from the south to the north. In Warri (south), the average daily temperature is 30°C, while the temperature at Asaba (north) is 44°C.

Increased prevalence of canine diseases presenting to veterinary clinics for treatment and the increased tendency for dog ownership in the State, coupled with the attendant need for periodic surveillance of the prevalence of dog diseases prompted for this survey. Hence, as part of the on-going effort to provide a profile of clinical cases of dogs in Nigeria, the aim, and objective of this study was to collect data from clinical case records of dogs admitted in selected veterinary clinics to provide documented information on the diagnosed clinical conditions of owned dogs in the State. This study is probably the first to report on disease profile of owned dogs in Delta State. It will add to the existing information as well as to the knowledge of the epidemiology of diseases of owned dogs in Nigeria.

Figure 1: Map of Nigeria showing the location of Delta State and the locations of the studied cities.

MATERIALS AND METHODS

Retrospective data on the diagnosed clinical cases of owned dogs from Delta State, Nigeria (Longitude 5°00' and 6°45' E; Latitude 5°00' and 6°30' N) were retrieved from clinical case records of selected private and government-owned veterinary clinics located at Asaba and Warri metropolitan areas of the State, over a period of three years (2012-2014) (**Figure 1**).

Six veterinary clinics comprising three private and government-owned clinics each was selected. The selection criteria were based on consistent records kept for the studied period and consent granted from the veterinary clinic management as well. Averages of 75 cases were recorded from each clinic, excluding dogs brought for routine deworming and vaccinations. The clinics enrolled in this study based their diagnoses mostly on history, physical examination and clinical signs. The distribution patterns of the cases were according to sex, age, breed, month and year of occurrence. The data obtained were then summarized as proportional incidence rates using percentage and presented in tabular and chart formats. Test of association between sex, age, breed, month, year of occurrence and the diagnosed cases was also assessed using likelihood ratio Chi-Squared statistics. The tests were two-tailed, while *P*-Values <0.05 were considered significant. STATA version 12 software (StataCorp LP, Texas, USA) was used to perform the data analysis. Figures were drawn with the aid of Microsoft Excel® 2010.

RESULTS AND DISCUSSION

This study has highlighted the most common clinical conditions of owned dogs presenting to veterinary clinics in Delta State, Nigeria. In all, 31 clinical conditions were diagnosed in 571 dogs during the studied period. Infectious diseases were found to account significantly (*P*=0.001) for 70.9% of the diagnosed cases, followed by nonspecific diseases or those with multiple causes having 21.6% while non-infectious diseases had the least (7.5%, **Figure 2**). This indicates that infections caused by pathogens are the major cause of disease in owned dogs with helminthoses (21.4%), mange (10.5%), parvovirosis (8.4%), babesiosis (7.9%), septicemia (7.2%), myiasis (7.0%), ectoparasitism (3.7%) and orchitis (1.1%) ranking as the most prevalent diseases. Similarly, gastroenteritis (7.0%), poisoning (6.0%), ascites (2.5), dermatitis (2.3%) and aural hematoma (1.2%) were the most common nonspecific clinical conditions reported to the veterinary clinics, while traumatic injuries was the gravest non-infectious disease affecting the dogs (**Tables 1–6**). Our observations corroborate similar findings from other parts of Nigeria (William et al., 2002; Onyenwe and Ikpegbu, 2004; Shima et al., 2014).

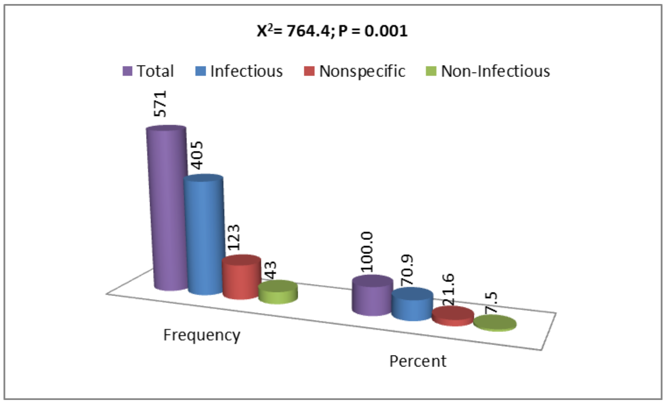

Figure 2: Distribution of the clinical conditions according to the cause classifications.

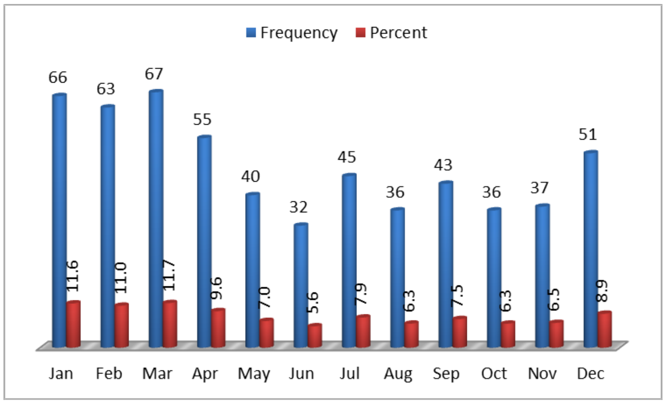

Figure 3: Percentage distribution of the clinical conditions according to month.

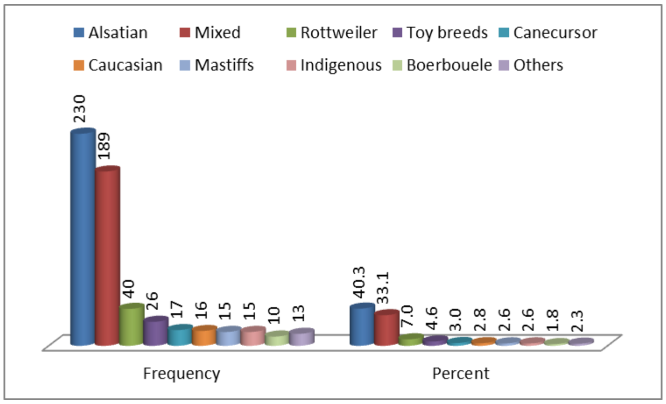

Figure 4: Breed distribution of diagnosed clinical conditions of own dogs in Delta State.

Effects of season on cases diagnosed (Table 1): Seasonal influence was observed with more of the disease incidence occurring in the wet season (50.3%) than dry season (49.7%). Perhaps the wet season has an intensifying effect on etiologic agents by creating optimal environmental conditions that favor their multiplication and survival. For instance, pools of stagnant water seen during the rainy season can create optimal breeding grounds and growth environments for vectors and hosts, including mosquitoes, mites, insects and rodents. Dry season was significant (*P*=0.031) for parvovirosis (5.4%). The excessive rainfall, high humidity, lower daily air temperature experienced in the State during the wet season, probably have a modulating effect on the growth and proliferation of parvovirus. During the dry season, some of the climatic factors might return to optimal hence favoring parvovirus multiplication and spread. Indeed, the annual pattern of spring and summer rains has been known to cause an increase in the outbreak of diseases such as leptospirosis (Ricardo Izurieta and Clem, 2008). Prolong wet environment created by rain can also exacerbate seasonal development and prevalence of diseases like dermatophilosis (The Merck Veterinary Manual 2009-2015). Most of the parvovirus infection in this study occurred during the early dry season (November and December). We presume this is the period the climatic factors are optimal for the proliferation of the etiologic agent. Aside this, the environmental stress experienced during the dry season might exert a negative influence on the immune system, thereby increasing the likelihood for parvovirus infection to occur.

Ectoparasitism (2.8%, *P*=0.013) and respiratory infections (0.5%, *P*=0.042), respectively, were significantly (*P*<0.05) associated with the wet season probably due to environmental and climatic conditions favorable for the breeding and hatchability of parasites' eggs as earlier mentioned. During dry seasons, some parasites, and their eggs are possibly dehydrated and desiccated owing to harsh weather conditions, hence the low incidence of ectoparasitism recorded during the dry season. The moderate infection rates due to it compared with the other high-ranking diseases observed in this study could be linked to ectoparasites control practices adopted by dog owners. Again, the wet season might activate etiologic agents for respiratory infections by creating enabling environment needed for their multiplication and survival. It is also plausible that due to climate and environmental changes, infectious diseases might unpredictably change their trends of occurrence.

Effects of the month on the cases diagnosed (Table 2 and Figure 3): More of the parvovirosis incidence significantly (*P*=0.02) took place during the dry season months compared to wet, this result agrees with the previous work on parvovirus in Nigeria (Shima et al., 2015a). In the wet season, the highest incidence of parvovirosis occurred in September. Septicemia was significantly (*P*=0.004) associated with the month of September. This coincides with the peak of cold in the

Table 1: Incidence of the diagnosed clinical conditions of owned dogs according to season

Disease condition	Total N (%)	Season Dry, n (%)	Season Wet, n (%)	X²	*P*-Value
Infectious					
1. Helminthoses	122 (21.4)	66 (11.6)	56 (9.8)	1.18	0.277
2. Mange	60 (10.5)	34 (6.0)	26 (4.6)	1.29	0.318
3. Parvovirosis	48 (8.4)	31 (5.4)	17 (3.0)	4.68	0.031*
4. Babesiosis	45 (7.9)	18 (3.2)	27 (4.7)	1.87	0.172
5. Septicemia	41 (7.2)	15 (2.6)	26 (4.6)	3.09	0.079
6. Myiasis	40 (7.0)	20 (3.5)	20 (3.5)	0.00	0.973
7. Ectoparasitism	21 (3.7)	5 (0.9)	16 (2.8)	6.16	0.013*
8. Orchitis	6 (1.1)	1 (0.2)	5 (0.9)	2.90	0.089
9. Ocular infections	5 (0.9)	1 (0.2)	4 (0.7)	1.91	0.167
10. Otitis	4 (0.7)	1 (0.2)	3 (0.5)	1.03	0.310
11. Ehrlichiosis	3 (0.5)	2 (0.4)	1 (0.2)	3.62	0.163
12. Respiratory infections	3 (0.5)	0 (0.0)	3 (0.5)	4.14	0.042*
13. Agalactia	2 (0.4)	1 (0.2)	1 (0.2)	0.00	0.994
14. Mastitis	1 (0.2)	1 (0.2)	0 (0.0)	1.40	0.237
15. Urinary tract infections	1 (0.2)	1 (0.2)	0 (0.0)	1.40	0.237
16. Hepatitis	1 (0.2)	1 (0.2)	0 (0.0)	1.40	0.237
17. Metritis	1 (0.2)	1 (0.2)	0 (0.0)	1.40	0.237
18. Lymphadenitis	1 (0.2)	0 (0.0)	1 (0.2)	1.38	0.241
Sub-total	405 (70.9)	199 (34.8)	206 (36.0)		
Nonspecific					
19. Gastroenteritis	40 (7.0)	22 (3.9)	18 (3.2)	0.48	0.490
20. Poisoning	34 (6.0)	18 (3.2)	16 (2.8)	0.15	0.700
21. Ascites	14 (2.5)	6 (1.1)	8 (1.4)	0.27	0.602
22. Dermatitis	13 (2.3)	7 (1.2)	6 (1.1)	0.09	0.764
23. Aural hematoma	7 (1.2)	2 (0.4)	5 (0.9)	1.31	0.252
24. Abortion	5 (0.9)	3 (0.5)	2 (0.4)	0.21	0.991
25. Tumor	4 (0.7)	1 (0.2)	3 (0.5)	1.03	0.310
26. Cherry eye	4 (0.7)	1 (0.2)	3 (0.5)	1.03	0.310
27. Alopecia	2 (0.4)	1 (0.2)	1 (0.2)	0.00	0.999
Sub-total	123 (21.6)	61 (10.7)	62 (10.9)		
Non-infectious					
28. Traumatic injuries	36 (6.3)	20 (3.5)	16 (2.8)	0.52	0.470
29. Snakebite	2 (0.4)	2 (0.4)	0 (0.0)	2.80	0.094
30. Paraplegia	4 (0.7)	2 (0.4)	2 (0.4)	0.00	1.000
31. Hip dysplasia	1 (0.2)	0 (0.0)	1 (0.2)	1.38	0.241
Sub-total	43 (7.6)	24 (4.3)	19 (3.3)		
Grand Total	**571 (100.0)**	**284 (49.7)**	**287 (50.3)**		

Asterisks (*) indicate a significant association

wet season. Cold weather might disrupt the immune system while supporting the proliferation of pathogens, which then take advantage of the weakened immune status to invade and cause septicemia in the host. It has been reported that initiation of a respiratory disease may be unconnected with cold weather, but cold weather may exacerbate disease symptoms (Heikki Olavi, 2007).

The month of February was significant for myiasis infestation (*P*=0.036). This coincides with the beginning of the warm or hot season when most vector flies breed. Myiasis can occur in any season of the year but could be more prevalent in the summer season, when the weather is warmest, while wet and dirty environment, long hair-coat, untended wounds, excrements, matted hair, and owner ignorance can predispose to myiasis infestation (Anderson and Huitson, 2004).

Table 2: Incidence of the diagnosed clinical conditions of owned dogs according to month

Disease condition	Month												X^2	*P*-Value
	J	F	M	A	M	J	J	A	S	O	N	D		
Infectious														
1. Helmithoses	17	13	14	11	6	5	8	8	13	5	8	14	7.2	0.787
2. Mange	9	8	9	8	2	2	5	5	1	3	4	4	10	0.529
3. Parvovirosis	7	6	4	0	3	1	2	2	7	2	7	7	22.6	0.020*
4. Babesiosis	3	7	7	7	6	3	5	2	2	2	0	1	17.8	0.086
5. Septicemia	3	1	4	3	4	2	0	4	10	3	5	2	27.1	0.004*
6. Myiasis	3	9	6	6	5	0	5	1	1	2	1	1	20.8	0.036*
7. Ectoparasitism	5	0	0	2	3	6	1	1	1	2	0	0	31.5	0.001*
8. Orchitis	0	0	1	0	1	0	0	1	1	2	0	0	12.8	0.309
9. Ocular infections	0	0	1	3	1	0	0	0	0	0	0	0	14.3	0.217
10. Ehrlichiosis	1	0	0	0	0	0	0	0	0	1	0	1	8.1	0.702
11. RT infections	0	0	0	2	0	0	1	0	0	0	0	0	10.7	0.468
12. Agalactia	0	1	0	1	0	0	0	0	0	0	0	0	6.3	0.850
13. Otitis	1	0	0	0	0	0	0	1	0	2	0	0	12.7	0.313
14. Mastitis	0	0	0	0	0	0	0	0	0	0	1	0	5.5	0.905
15. UT infections	0	0	0	0	0	0	0	0	0	0	1	0	5.5	0.905
16. Hepatitis	0	1	0	0	0	0	0	0	0	0	0	0	4.4	0.956
17. Metritis	1	0	0	0	0	0	0	0	0	0	0	0	4.3	0.959
18. Lymphadenitis	0	0	0	0	0	1	0	0	0	0	0	0	5.8	0.887
Sub-total	56	50	50	45	34	21	33	26	38	27	29	36		
Nonspecific														
19. Gastroenteritis	6	4	4	2	3	1	6	1	2	3	2	6	8.3	0.687
20. Poisoning	3	4	6	2	4	5	1	1	2	1	1	4	10.9	0.448
21. Ascites	0	0	2	0	1	1	1	1	1	3	2	2	13.9	0.237
22. Dermatitis	0	3	1	3	0	1	1	1	0	0	0	3	15.8	0.149
23. Aural hematoma	1	0	1	1	0	0	3	0	0	1	0	0	13.6	0.256
24. Abortion	1	1	1	0	0	1	0	1	0	0	0	0	8.3	0.689
25. Tumor	0	1	0	2	0	1	0	0	0	0	0	0	11.3	0.418
26. Cherry eye	0	0	1	1	0	0	0	1	1	0	0	0	8.6	0.656
27. Alopecia	0	0	0	0	0	0	0	1	0	0	0	1	7.6	0.746
Sub-total	5	9	12	9	5	9	6	6	4	5	3	10		
Noninfectious														
28. Traumatic injuries	5	3	5	1	1	2	5	2	1	4	5	2	11.6	0.393
29. Paraplegia	0	0	0	0	0	0	0	2	0	0	0	2	15.3	0.168
30. Snake bite	0	1	0	0	0	0	0	0	0	0	0	1	6.5	0.838
31. Hip dysplasia	0	0	0	0	0	0	1	0	0	0	0	0	5.1	0.926
Sub-total	5	4	5	1	1	2	6	4	1	4	5	5		
Grand Total	**66**	**63**	**67**	**55**	**40**	**32**	**45**	**36**	**43**	**36**	**37**	**51**		

RT=respiratory tract; UT=urinary tract; Asterisks (*) indicate a significant association

In contrast, the month of June was significant (*P*=0.001) for ectoparasitism. This might occur possibly by chance. We recorded the lowest incidence of disease in the month of June (5.6%; **Figure 3**) compared with the other months. To our knowledge, at present, there is a paucity of information regarding the seasonality of myiasis and ectoparasitism in Nigeria. However, it has been documented that, most ticks, for instance, cannot tolerate direct sunlight, dryness, or excessive rainfall; tick activity usually decreases during the cold months and increases during spring, summer, and fall in the temperate regions (Ballweber, 2001).

Effects of the year on the cases diagnosed (Table 3): The year 2013 was significant (*P*=0.041) for parvovirosis. This could be credited to the population distribution of the parvovirosis cases by the year, the willingness of owners presenting such cases to the veterinarians, as well as the economic value of the dog breeds.

Notwithstanding, the higher incidence may be related to vaccination failure (due to poor cold chain, or incomplete dose administration) or failure to vaccinate

Table 3: Incidence of the diagnosed clinical conditions of owned dogs according to year

Disease condition	Total N (%)	Year 2012, n (%)	2013, n (%)	2014, n (%)	X²	*P*-Value
Infectious						
1. Helminthoses	122 (21.4)	42 (7.4)	42 (7.4)	38 (6.7)	3.22	0.200
2. Mange	60 (10.5)	22 (3.9)	20 (3.5)	18 (3.2)	1.91	0.385
3. Parvovirosis	48 (8.4)	14 (2.5)	22 (3.9)	12 (2.1)	6.39	0.041*
4. Babesiosis	45 (7.9)	15 (2.6)	12 (2.1)	18 (3.2)	0.31	0.856
5. Septicemia	41 (7.2)	23 (4.0)	13 (2.3)	5 (0.9)	17.23	0.001*
6. Myiasis	40 (7.0)	7 (1.2)	5 (0.9)	28 (4.9)	18.37	0.001*
7. Ectoparasitism	21 (3.7)	1 (0.2)	8 (1.4)	12 (2.1)	9.94	0.007*
8. Orchitis	6 (1.1)	3 (0.5)	1 (0.2)	2 (0.4)	1.03	0.599
9. Ocular infections	5 (0.9)	0 (0.0)	1 (0.2)	4 (0.7)	5.16	0.076
10. Otitis	4 (0.7)	1 (0.2)	0 (0.0)	3 (0.5)	3.62	0.163
11. Ehrlichiosis	3 (0.5)	0 (0.0)	1 (0.2)	2 (0.4)	2.45	0.294
12. RT infections	3 (0.5)	1 (0.2)	1 (0.2)	1 (0.2)	0.03	0.985
13. Agalactia	2 (0.4)	1 (0.2)	0 (0.0)	1 (0.2)	1.46	0.481
14. Mastitis	1 (0.2)	1 (0.2)	0 (0.0)	0 (0.0)	2.30	0.316
15. UT infection	1 (0.2)	0 (0.0)	1 (0.2)	0 (0.0)	2.39	0.302
16. Hepatitis	1 (0.2)	1 (0.2)	0 (0.0)	0 (0.0)	2.30	0.316
17. Metritis	1 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)	2.30	0.316
18. Lymphadenitis	1 (0.2)	0 (0.0)	0 (0.0)	1 (0.2)	1.94	0.379
Sub-total	405 (70.9)	133 (23.3)	127 (22.2)	145 (25.4)		
Nonspecific						
19. Gastroenteritis	40 (7.0)	5 (0.9)	14 (2.5)	21 (3.7)	8.84	0.012*
20. Poisoning	34 (6.0)	14 (2.5)	7 (1.2)	13 (2.3)	2.20	0.333
21. Ascites	14 (2.5)	4 (0.7)	5 (0.9)	5 (0.9)	0.20	0.906
22. Dermatitis	13 (2.3)	2 (0.4)	2 (0.4)	9 (1.6)	5.32	0.070
23. Aural hematoma	7 (1.2)	1 (0.2)	4 (0.7)	2 (0.4)	2.37	0.305
24. Abortion	5 (0.9)	3 (0.5)	2 (0.4)	0 (0.0)	4.97	0.083
25. Tumor	4 (0.7)	1 (0.2)	0 (0.0)	3 (0.5)	3.62	0.163
26. Cherry eye	4 (0.7)	0 (0.0)	2 (0.4)	2 (0.4)	3.12	0.211
27. Alopecia	2 (0.4)	1 (0.2)	0 (0.0)	1 (0.2)	1.46	0.481
Sub-total	123 (21.6)	31 (5.5)	36 (6.4)	56 (9.8)		
Non-infectious						
28. Traumatic injuries	36 (6.3)	15 (2.6)	8 (1.4)	13 (2.3)	2.05	0.360
29. Snakebite	2 (0.4)	1 (0.2)	1 (0.2)	0 (0.0)	1.92	0.383
30. Paraplegia	4 (0.7)	1 (0.2)	1 (0.2)	2 (0.4)	0.24	0.887
31. Hip dysplasia	1 (0.2)	0 (0.0)	0 (0.0)	1 (0.2)	1.94	0.379
Sub-total	43 (7.5)	17 (3.0)	10 (1.8)	16 (2.8)		
Grand Total	**571 (100.0)**	**181 (31.7)**	**173 (30.3)**	**217 (38.0)**		

RT=respiratory tract; UT=urinary tract; Asterisks (*) indicate a significant association

owned dogs, and the unwillingness of low-income dog owners to pay for vaccination or veterinary health care. To our knowledge, there is limited published data on canine parvovirus in Africa including Nigeria. The available published information could not justify the seasonality of this disease (Mohammed et al., 2005; Dogonyaro, 2010; Nwoha, 2011; Mcree et al., 2014; Shima et al., 2015b). Differences in climate for the different geographical regions, in our opinion, likely have modulating effects on the seasonality of parvovirosis. For Delta State and Nigeria at large, seasonality of canine parvovirus infection has remained elusive. A 14-year retrospective study of clinical record at Warri region of the State shows that parvovirus infection peak incidence appears to occur every 4 to 5 years (Shima et al., 2015b). To understand a seasonal trend of this disease better, further studies taking into cognizance, the climatic factors and

Table 4: Breed distribution of diagnosed clinical conditions of own dogs in Delta State

Disease condition	Total N (%)	Native	Mixed	Alsatian	Rottweiler	Toy	Mastiffs	Boer	Caucasian	Cane	Others	*P*-Value
		Breed										
Infectious												
1. Helminthoses	122 (21.4)	2	38	58	9	6	4	0	0	0	5	0.001*
2. Mange	60 (10.5)	2	29	19	0	2	4	2	1	0	1	0.009*
3. Babesiosis	48 (8.4)	0	11	28	3	1	0	0	1	0	1	0.075
4. Parvovirosis	45 (7.9)	1	21	12	5	2	0	1	3	2	1	0.183
5. Septicemia	41 (7.2)	2	5	24	4	0	0	1	2	1	2	0.024*
6. Myiasis	40 (7.0)	2	18	13	0	3	1	1	1	1	0	0.308
7. Ectoparasitism	21 (3.7)	2	3	6	4	1	0	0	0	5	0	0.003*
8. Orchitis	6 (1.1)	0	2	3	0	0	0	1	0	0	0	0.821
9. Ocular infections	5 (0.9)	0	0	4	0	0	0	0	0	1	0	0.496
10. Otitis	4 (0.7)	0	1	1	0	0	0	0	2	0	0	0.414
11. Ehrlichiosis	3 (0.5)	0	1	1	0	0	0	1	0	0	0	0.846
12. Resp. tract infections	3 (0.5)	0	2	1	0	0	0	0	0	0	0	0.992
13. Agalactia	2 (0.4)	0	1	1	0	0	0	0	0	0	0	1.000
14. Mastitis	1 (0.2)	0	1	0	0	0	0	0	0	0	0	0.994
15. Urinary infections	1 (0.2)	0	1	0	0	0	0	0	0	0	0	0.994
16. Hepatitis	1 (0.2)	0	0	1	0	0	0	0	0	0	0	0.998
17. Metritis	1 (0.2)	0	0	1	0	0	0	0	0	0	0	0.998
18. Lymphadenitis	1 (0.2)	0	0	1	0	0	0	0	0	0	0	0.998
Sub-total	405 (70.9)	11	134	174	25	15	9	7	10	10	10	
Nonspecific												
19. Gastroenteritis	40 (7.0)	0	13	12	4	3	3	0	1	2	2	0.345
20. Poisoning	34 (6.0)	3	11	7	5	3	1	1	1	0	0	0.037*
21. Ascites	14 (2.5)	0	4	8	1	0	0	0	0	1	0	0.788
22. Dermatitis	13 (2.3)	0	3	6	0	0	0	0	2	2	0	0.209
23. Aural hematoma	7 (1.2)	1	1	5	0	0	0	0	0	0	0	0.674
24. Abortion	5 (0.9)	0	3	1	0	0	0	0	0	0	1	0.711
25. Cherry eye	4 (0.7)	0	0	0	1	0	1	0	0	2	0	0.045*
26. Tumor	4 (0.7)	0	3	0	0	1	0	0	0	0	0	0.593
27. Alopecia	2 (0.4)	0	1	1	0	0	0	0	0	0	0	1.000
Sub-total	223 (21.6)	4	39	40	11	7	5	1	4	7	3	
Noninfectious												
28. Traumatic injuries	36 (6.3)	0	14	12	4	2	1	2	1	0	0	0.598
29. Snake bite	4 (0.7)	0	0	2	0	0	0	0	0	0	0	0.962
30. Paraplegia	2 (0.4)	0	1	2	0	0	0	0	1	0	0	0.908
31. Hip dysplasia	1 (0.2)	0	1	0	0	0	0	0	0	0	0	0.994
Sub-total	43 (7.5)	0	16	16	4	2	1	2	2	0	0	
Total	**571 (100)**	15	189	230	40	26	15	10	16	17	13	

Native = indigenous; Toy=toy breeds; Boer=Boerbouele; Cane=Cane cursor; Others= Doberman, Great Dane, Pit-bull, Dalmatian, and Bulldog; RTI=respiratory tract infections; UTI=urinary tract infections.
Asterisks (*) indicate a significant association

parvovirus incidence, recorded over time for the different seasons may be valuable.

As regards the significant association of septicemia (4.0%; *P*=0.001), myiasis (4.9%, *P*=0.001), ectoparasitism (2.1%, *P*=0.007), and gastroenteritis (3.7%, *P*=0.012) with the year 2014, it is construed that, owing to the economic value of some dog breeds, owners perhaps were more willing to present their dogs with these cases to the veterinarians in a particular year. For

Table 5: Sex distribution of diagnosed clinical conditions of own dogs in Delta State

Disease condition	Total N (%)	Sex		X^2	*P*-Value
		Male, n (%)	Female, n (%)		
Infectious					
1. Helminthoses	122 (21.4)	48 (8.4)	74 (13.0)	8.94	0.003*
2. Mange	60 (10.5)	29 (5.1)	31 (5.4)	0.24	0.625
3. Parvovirosis	48 (8.4)	31 (5.4)	17 (3.0)	3.75	0.053*
4. Babesiosis	45 (7.9)	28 (4.9)	17 (3.0)	2.35	0.125
5. Septicemia	41 (7.2)	17 (3.0)	24 (4.2)	1.72	0.190
6. Myiasis	40 (7.0)	20 (3.5)	20 (3.5)	0.03	0.863
7. Ectoparasitism	21 (3.7)	14 (2.5)	7 (1.2)	2.10	0.147
8. Orchitis	6 (1.1)	6 (1.1)	0 (0.0)	8.07	0.005*
9. Ocular infections	5 (0.9)	2 (0.4)	3 (0.5)	0.26	0.610
10. Otitis	4 (0.7)	3 (0.5)	1 (0.2)	0.95	0.330
11. Ehrlichiosis	3 (0.5)	2 (0.4)	1 (0.2)	0.29	0.590
12. Respiratory tract infections	3 (0.5)	1 (0.2)	2 (0.4)	0.40	0.529
13. Agalactia	2 (0.4)	0 (0.0)	2 (0.4)	2.87	0.089
14. Mastitis	1 (0.2)	0 (0.0)	1 (0.2)	1.44	0.230
15. Urinary tract infection	1 (0.2)	1 (0.2)	0 (0.0)	1.34	0.248
16. Hepatitis	1 (0.2)	1 (0.2)	0 (0.0)	1.34	0.248
17. Metritis	1 (0.2)	0 (0.0)	1 (0.2)	1.44	0.230
18. Lymphadenitis	1 (0.2)	1 (0.2)	0 (0.0)	1.34	0.248
Sub-total	405 (70.9)	204 (35.8)	201 (35.2)		
Nonspecific					
19. Gastroenteritis	40 (7.0)	23 (4.0)	17 (3.0)	0.66	0.416
20. Poisoning	34 (6.0)	23 (4.0)	11 (1.9)	3.95	0.047*
21. Ascites	14 (2.5)	8 (1.4)	6 (1.1)	0.20	0.658
22. Dermatitis	13 (2.3)	5 (0.9)	8 (1.4)	0.89	0.347
23. Aural hematoma	7 (1.2)	1 (0.2)	6 (1.1)	4.28	0.039*
24. Abortion	5 (0.9)	0 (0.0)	5 (0.9)	7.24	0.007*
25. Cherry eye	4 (0.7)	1 (0.2)	3 (0.5)	1.16	0.281
26. Tumor	4 (0.7)	2 (0.4)	2 (0.4)	0.00	0.958
27. Alopecia	2 (0.4)	2 (0.4)	0 (0.0)	2.68	0.102
Sub-total	223 (21.6)	65 (11.4)	58 (10.2)		
Non-infectious					
28. Traumatic injuries	36 (6.3)	20 (3.5)	16 (2.8)	0.23	0.598
29. Paraplegia	4 (0.7)	1 (0.2)	3 (0.5)	1.16	0.281
30. Snakebite	2 (0.4)	2 (0.4)	0 (0.0)	2.68	0.102
31. Hip dysplasia	1 (0.2)	1 (0.2)	0 (0.0)	1.34	0.248
Sub-total	43 (7.5)	24 (4.2)	19 (3.3)		
Grand Total	**571 (100.0)**	**293 (51.3)**	**278 (48.7)**		

Asterisks (*) indicate a significant association

instance, Alsatian and Rottweiler are some of the popular breeds use as guard dogs in the State. Hence, owners who value these breeds or consider them as part of the family would certainly give maximum veterinary attention to them.

Furthermore, we recorded more cases (38.0%) in the year 2014 compared with the others, which certainly, indicates some of the veterinary clinics were better at keeping records. The significant difference in disease incidence across the years may undoubtedly occur by chance.

Effects of breed on the cases diagnosed (Figure 4 and Table 4): Of the dog breeds, Alsatian (40.3%), mixed/cross breeds (33.1%), Rottweiler (7.0%) and toy breeds (4.6%) were mostly affected. Population distribution owing to an upsurge in acquisition and use

Table 6: Age distribution of diagnosed clinical conditions of owned dogs in Delta State

Disease condition	Total N (%)	Age: Puppy (0-7 Mo), n (%)	Adolescent (8 Mo-1 yr), n (%)	Adult (> 2 yrs), n (%)	NAI n (%)	X^2	*P*-Value
Infectious							
1. Helminthoses	122(21.4)	52 (9.1)	27 (4.7)	37 (6.5)	6 (1.1)	8.16	0.043*
2. Mange	60 (10.5)	9 (1.6)	16 (2.8)	31 (5.4)	4 (0.7)	12.40	0.006*
3. Parvovirosis	48 (8.4)	32 (5.6)	10 (1.8)	4 (0.7)	2 (0.4)	32.84	0.001*
4. Babesiosis	45 (7.9)	8 (1.4)	9 (1.6)	27 (4.7)	1 (0.2)	8.87	0.031*
5. Septicemia	41 (7.2)	16 (2.8)	9 (1.6)	16 (2.8)	0 (0.0)	3.65	0.302
6. Myiasis	40 (7.0)	25 (4.4)	7 (1.2)	8 (1.4)	0 (0.0)	17.57	0.001*
7. Ectoparasitism	21 (3.7)	1 (0.2)	6 (1.1)	11 (1.9)	3 (0.5)	13.30	0.004*
8. Orchitis	6 (1.1)	0 (0.0)	1 (0.2)	4 (0.7)	1 (0.2)	6.42	0.025*
9. Ocular infects.	5 (0.9)	0 (0.0)	2 (0.4)	3 (0.5)	0 (0.0)	4.81	0.186
10. Ehrlichiosis	3 (0.5)	2 (0.4)	1 (0.2)	0 (0.0)	0 (0.0)	3.59	0.310
11. RT infections	3 (0.5)	0 (0.0)	1 (0.2)	2 (0.4)	0 (0.0)	2.85	0.416
12. Agalactia	2 (0.4)	0 (0.0)	1 (0.2)	1 (0.2)	0 (0.0)	2.09	0.554
13. Otitis	4 (0.7)	1 (0.2)	1 (0.2)	2 (0.4)	0 (0.0)	0.51	0.916
14. Mastitis	1 (0.2)	0 (0.0)	0 (0.0)	1 (0.2)	0 (0.0)	1.80	0.614
15. UT infections	1 (0.2)	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)	3.06	0.382
16. Hepatitis	1 (0.2)	0 (0.0)	0 (0.0)	1 (0.2)	0 (0.0)	1.80	0.614
17. Metritis	1 (0.2)	0 (0.0)	0 (0.0)	1 (0.2)	0 (0.0)	1.80	0.614
18. Lymphadenitis	1 (0.2)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	2.17	0.537
Sub-total	405 (70.9)	147 (25.7)	92 (16.1)	149 (26.0)	17 (3.0)		
Nonspecific							
19. Gastroenteritis	40 (7.0)	22 (3.9)	8 (1.4)	10 (1.8)	0 (0.0)	11.10	0.011*
20. Poisoning	34 (6.0)	7 (1.2)	11 (1.9)	12 (2.1)	4 (0.7)	7.99	0.046*
21. Ascites	14 (2.5)	1 (0.2)	1 (0.2)	12 (2.1)	0 (0.0)	12.88	0.005*
22. Dermatitis	13 (2.3)	2 (0.4)	2 (0.4)	9 (1.6)	0 (0.0)	5.17	0.159
23. Aural hematoma	7 (1.2)	0 (0.0)	0 (0.0)	7 (1.2)	0 (0.0)	12.74	0.005*
24. Abortion	5 (0.9)	0 (0.0)	1 (0.2)	4 (0.7)	0 (0.0)	5.29	0.152
25. Tumor	4 (0.7)	0 (0.0)	0 (0.0)	4 (0.7)	0 (0.0)	7.25	0.064
26. Cherry eye	4 (0.7)	1 (0.2)	2 (0.4)	0 (0.0)	1 (0.2)	6.53	0.089
27. Alopecia	2 (0.4)	0 (0.0)	0 (0.0)	2 (0.4)	0 (0.0)	3.61	0.306
Sub-total	223 (21.6)	33 (5.8)	25 (4.4)	60 (10.6)	5 (0.9)		
Non-infectious							
28. Tr. injuries	36 (6.3)	11 (1.9)	4 (0.7)	21 (3.7)	0 (0.0)	8.02	0.046*
29. Paraplegia	4 (0.7)	1 (0.2)	1 (0.2)	2 (0.4)	0 (0.0)	0.51	0.916
30. Snake bite	2 (0.4)	0 (0.0)	2 (0.4)	0 (0.0)	0 (0.0)	6.13	0.105
31. Hip dysplasia	1 (0.2)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	2.17	0.537
Sub-total	43 (7.5)	13 (2.3)	7 (1.2)	23 (4.0)	0 (0.0)		
Grand Total	**571(100.0)**	**193 (33.8)**	**124 (21.7)**	**232 (40.6)**	**22 (3.9)**		

RT=respiratory tract; UT=urinary tract; Tr.= traumatic/accidental; NAI=No age information; Mo=month; Asterisks (*) indicate a significant association

of these breeds for security and breeding might be responsible for the high incidence of diseases observed in them. Secondly, maybe the economic value of the pure breeds or pedigrees prompted owners to give them maximum veterinary attention. In general, this underscores the role of the immune status and hereditary influence on breed susceptibility to diseases.

Alsatian was significantly affected by helminthoses (*P*=0.001), septicemia (*P*=0.009) and ectoparasites (*P*=0.003). Ectoparasitism might be common in Alsatian due to its hairiness. In general, the occurrence of ectoparasitism, heminthoses, mange, and septicemia might relate to management issues such as keeping dogs on free range, insufficient housing, inadequate deworming practices, lack of antibiotics cover, and inadequate ectoparasites control practices. Another factor to consider here is drugs or pesticides ineffectiveness and resistance. Most dog owners in Delta State do not provide kennels for their dog apart from chaining and the house fence, if present. Ignorance and unwillingness to pay for veterinary treatment due to cost might also contribute to the high incidence of these disease conditions. Besides dogs, helminthoses, enteritis, and ectoparasitism are the most prevalent diseases also reported in livestock and poultry alike in Nigeria (Okolocha et al., 2007; Agada et al., 2010; Garba et al., 2011).

Mixed dog breeds were significant (*P*=0.009) for mange probably due to alterations in their genetic makeup owing to crossbreeding. Invariably, genetic diversity makes dogs more resistant to infections, Rottweiler, Alsatian, and Caucasians, which are a pure breed of dogs, are more prone to infections than crossed breeds. Similarly, mixed dog breeds were significantly (*P*=0.037) affected by poisoning compared to the others. This corroborates the finding by Shima et al. (2015a), who also reported a higher incidence of poisoning in mixed breeds, Alsatian, and Rottweiler compared with the others. In that study, population distribution owing to owners' preference for these breeds as guard dogs and the dogs' presenting protector behaviors that risk them as targets to criminal and malicious poisoning were implicated as the predisposing factors in dogs poisoning. Indeed, immunodepression is said to be a common finding in German shepherds with parasitic infestation and canine parvovirus enteritis (Toman et al., 1998). Lack of genetic diversity or genetic restriction is also known to accompany immunosuppression in dogs; this is also responsible for the high susceptibility to infections seen in pedigree dogs recorded in this study (Leroy, 2011).

The factors predisposing to the poisoning of dogs in the State are comparable to those reported earlier as the causes of toxicosis and mortality in dogs with human-related factors being incriminated (Shima et al., 2014; 2015a). Cane cursor was significant (*P*=0.045) for cherry eye. This condition affects mostly the American Cocker Spaniel, English bulldog, Lhasa apso, and mostly younger dogs less than 1 year (Fossum, 2002). The significant association of Cane cursor with this eye condition might occur by chance. Sequel to the fewer cases recorded in this study, it is difficult to justify its association with this breed.

Effects of sex on the cases diagnosed (Table 5): Helminthoses (13.0%), aural hematoma (1.1%) and abortion (0.9%) were significantly ($P<0.05$) associated with female dogs.

Although female dogs were highly represented in this study, apart from abortion, which is a clinical condition of female animals, the significant association of helminthoses and aural hematoma with female dogs may be probably due to stress during pregnancy, parturition, and weaning.

Furthermore, canine parvovirus disease (5.4%), orchitis (1.1%), and poisoning (4.0%) were significantly ($P<0.05$) higher in the male dogs. Orchitis is a clinical condition of male dogs. The higher incidences of parvovirosis recorded in the males corroborate prior studies (Castro et al., 2007; Gombac et al., 2008; Shima et al., 2015b). Some of the studies had reported a significant association of male dogs with parvovirus infection while others did not. The reason being that, parvovirus affects dogs of all ages and sexes. Nonetheless, the prevalence might be higher in male dogs of mating age due to indiscriminate mating, or sniffing and licking of the anal region of infected females soiled with virus-contaminated feces. This might occur, especially at the point of conglomeration when male dogs compete over an infected female at estrus (Shima et al., 2015b). Feco-oral transmission is an important route in parvovirus transmission (Decaro et al., 2005). The higher incidence of poisoning in male dogs also corroborates the findings of Shima et al. (2015a). This in part is due to population distribution by sex and owing to allowing male dogs to roam and scavenge freely, hence predisposing them to mischievous and malicious poisonings. In the studied region, most people prefer male than female dogs for security, to avoid the responsibility associated with whelping, weaning and nursing of puppies. Hence, there was a higher population of male dogs in this study and subsequent higher incidence of poisoning recorded in the male dogs. Previous studies have shown that there are limited cases of sex difference being associated with poisons in animals (Tiwari and Sinha, 2010). It appears dog owners do provides better veterinary care for males than the females, probably due to their use as guard dogs. Invariably, female dogs may be accorded better veterinary attention owing to their reproductive and breeding performance.

Effects of age on the cases diagnosed (Table 6): Of the age distributions, 33.8% of the dogs presented with the various clinical conditions were puppies, adolescents

(21.7%), and adults (40.6%), while 3.9% had no age information. Adult dogs and puppies apparently received better veterinary care or had a higher incidence of disease compared with the adolescents probably due to their age and immune status.

The immune status may be incompetent or weakened at tender or old age. The higher population of adult dogs in this study could be related to their higher economic value than puppies and hence the more the willingness of owners to pay for veterinary treatment. Due to social vices and insecurity experienced in some parts of the State, high-income earners, who valued their dogs as the case may be, were more willing to pay for veterinary treatment on adults than on puppies, which might take some time before attaining maturity.

Furthermore, helminthoses (9.1%), parvovirosis (5.6%), myiasis (4.4%) and gastroenteritis (3.9%) are the clinical conditions that were found affecting significantly (P<0.05), the puppies compared to the other age groups. Lower immunity in puppies, lack of pre-exposure vaccination, poor or no deworming of pregnant bitches prior to parturition or puppies at early weeks of life, insufficient maternal immunity, drug/vaccine failure or resistance, and inadequate owner awareness seem to be some of the predisposing factors for the higher incidence of diseases in the puppies.

The higher incidence of myiasis recorded in the puppies may be in connection with diarrhea that could predispose to flies infestation. Again, puppies that are allowed access to the wet and dirty environment or soil contaminated with dipteran flies' eggs are at a higher risk of myiasis infestation. In the same vein, the moderately high incidence of myiasis (7.0%) recorded in studied areas is likely due to two major factors: 1) the prevalence of vector flies in the studied region, bolstered by warm and humid climate, and 2) inadequate prophylactic care; hence owner education may help in alleviating this problem. Myiasis infestation has economically damaging effect on livestock owing to financial losses (Otranto, 2001). However, as at the period of this study, no such economic appraisal was found documented for dogs. Indirectly, financial losses may be incurred through treatment of the affected dogs. Secondary bacterial infections might occur concurrently with myiasis-infested wounds (Islam et al., 2015).

The higher prevalence of parvovirosis in the puppies in our study also corroborates similar findings from other parts of the world (Decaro et al., 2005; Shima et al., 2015b), which is an indication that age and immune deficiency are major risk factors for the viral transmission. In the studied region, due to the cost of vaccines and veterinary labor, most low-income earners that raise many puppies, could not afford the cost of vaccination. Hence, the higher incidence of parvovirus infection recorded in puppies compared with the others. A single dose of Triple vaccine (DHLPP) and the antirabies vaccine could cost each between NGN 1, 500-NGN 2, 500. However, managing a clinical case of parvovirus infection is relatively more costly and could cost above NGN 15,000 compared to prophylactic treatment. In addition, it may be credited to ignorance and unawareness regarding the availability of prophylaxis vaccination for this disease.

Unlike in the puppies, adult dogs were significantly (P<0.05) associated with mange (5.4%), babesiosis (4.7%), traumatic/accidental injuries (3.7%), ectoparasitism (1.9%), poisoning (2.1%), ascites (2.1%), aural hematoma (1.2%) and orchitis (0.7%). Canine babesiosis is a common occurrence in Nigeria owing to the prevalence of tick vectors. Its prevalence ranged from 2.0 to 43.6% and it occurs throughout the country (Ogo et al., 2011), while *Babesia rossi, B. canis* and *B. Vogeli* are babesia species indigenous to Nigeria (Ogo et al., 2012; Kamani et al., 2013; Adamu et al., 2014).

High incidence of trauma, leading to injury or death of dogs was also reported previously (Shima et al., 2014). Poor housing, inadequate care, free-ranging domestic dogs, mischievous and malicious actions, and vehicular activities are some of the major factors that predispose to trauma in dogs. In the same manner, the moderately high incidence of poisoning recorded previously and in this study (Shima et al., 2014; 2015b) has a link with human activities such as intruders attempt to demobilize security, malicious acts, and indiscriminate application of chemicals to the environment and wrong use of drugs and anti-ectoparasitic chemicals on dogs. The incidence of 6.0% recorded in our study is rather higher than 2.51% reported at Ibadan, Nigeria (Okusanya et al., 2014).

Older dogs were also significantly associated with ascites, corroborating past study (Ihedioha et al. 2011). This may be associated with vital organs (heart, liver, and kidney) damage/failure, which is mostly associated with ascites at old age. The tendency for the heart to failure or the liver or kidney to be damaged is more in older animals except where the organ damage/failure is congenital (Ihedioha et al., 2011). The significantly (P=0.005) higher incidence of aural hematoma recorded in older dogs may be connected with trauma or lacerations sustained on the ears during a dogfight, as fighting is common among adult dogs. The causes of hematomas are still unknown to researchers.

Similarly, trauma may be more common in adults because of their defensive behavior or territorial nature, which risk them to mischievous targets and malicious acts or those kept on free range. Furthermore, ectoparasitism may be higher in adult dogs kept on free range or among non-stray dogs where owners have not adopted a good ectoparasites control measure. The significantly high incidence of mange recorded in the older dogs might be due to incompetent or weakened immune system and inefficient ectoparasites control. Mange (10.5%) like other skin infections such as myiasis (7.0%), dermatitis (2.3%) and alopecia (0.4%) reported here, are in most cases, caused by ectoparasites owing to management issues.

The least occurring diseases, clinical cases with less than 1% incidence in this study, may be connected with under-diagnoses, under-presentation of such cases to veterinary clinics, poor record keeping and the constraints in getting access to clinical records of some of the veterinary clinics in the State. Furthermore, the obvious absence of clinical cases of rabies in this study may be related to vaccination, awareness or under-reporting. Suspected rabid dogs may be killed without seeking veterinary attention.

Limitations: Record keeping was not homogeneous across the veterinary clinics and periods, and this could be a potential source of bias. Clients presenting to the various clinics were not a representative of the whole population of dog owners. Poor record keeping was another challenge in some clinics. We could not get access to the clinical records of those clinics that based their services mostly on a house call, as they hardly keep their patients' records. Permission to access clinical records of clinics some was not granted, while some of the clinics enrolled in this study only granted limited access to their records. Cases with inadequate documentation were excluded or were not considered for the purpose of this study the study.

CONCLUSION

This study has provided a valuable insight into the most common clinical cases of owned dogs in the Delta State of Nigeria, with preventable clinical conditions constituting the major problems. Most are preventable via prophylactic treatment such as routine deworming, vaccination, ectoparasites control measures, as well as by dedicating adequate attention to pets. Hence, the problems may be related to owner unawareness of available prophylaxis or not adding much importance to preventive veterinary care. It is, however, more cost-effective to prevent some of these diseases than to treat them. Owner education regarding disease control and prevention may be helpful. Above all, relevant government agencies involved in the promotion of animal health should formulate and embark on policies that will prevent and/or control diseases in dogs, especially policies aimed at owner awareness, provision of subsidized treatment or drugs for prophylaxis. Furthermore, poor patients' history taking was observed during the course of this study; hence, management of veterinary clinics should improve in this aspect. They should devise better methods of record keeping, preferably computerized, for easy access and retrieval, and should be generous with clinical data for vital studies of this nature.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

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