

Retrospective study of Canine Parvoviral Enteritis in Ilorin, North Central, Nigeria

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Summary

One of the major diseases reducing dog population is Canine parvoviral enteritis (CPE) caused by canine parvovirus (CPV). This study was conducted to know the status of the disease among dog population in Ilorin, Kwara state which had no published data of CPE epidemiology. A retrospective study was carried out in the State Zonal Veterinary Clinic of Kwara State. A total of 4,000 clinical records were examined and a 10-year study involving clinical cases from March 2007 to February 2017 were considered. This study showed CPE prevalence of 6.4% in the 10-year study and it majorly affected puppies, unvaccinated dogs and dogs used for breeding purposes. CPE cases were high during the dry season (peaks at October and January) though it could also peak during the rainy season (July). Vaccinated dogs (8.6%; 9/105) were also found to come down with CPE. Intraspecies transmissions were also traced among dogs of the same household (35.2%; 37/105). It was also observed that the understanding of vaccination protocol for neonate and adult dogs post-infection is critical. Antibody titer testing can stand as a guide for vaccination against canine parvovirus.

Key words: *Vaccine failure, Canine parvoviral enteritis, CPV 2 variants, Ilorin*

Introduction

The affection developed by humans towards animals like dogs and cats continues to deepen in this twenty-first century (6). In fact, at some instance, dogs and cats have become adopted as part of the family that their death could be mourned by humans for months. Among domesticated animals, dog remains the most popular. One of the major diseases reducing dog population is Canine parvoviral enteritis (CPE) caused by canine parvovirus (CPV), and has made many dog lovers to groan at one time or the other culminating from the death of their beloved dog and economic losses from treatment. CPV possesses a single stranded non enveloped deoxyribonucleic acid (DNA) of 4-6kbp in size. The virion has icosahedral symmetry and is 25nm in diameter. Replication is mostly preferred in nucleus of dividing cells such as enterocytes, myocytes

and blood cell progenitors with subsequent deposition of intranuclear inclusion bodies. The virus has ability to haemagglutinate red blood cell (19). Currently, there are three variants: CPV-2a, CPV-2b and CPV-2c and are suggested to possess similar pathogenicity and indistinguishable clinical presentations (8, 17). The virus is hardy and stable in the environment withstanding temperature of 60°C for 60 minutes and pH 3 to pH 9 (19). The virus is worldwide in distribution and all dogs are suggested to be susceptible though some breeds such as Alsatian, Labrador and Rottweiler tend to be more affected (26).

Transmission is commonly through faeco-oral route as virus is continually being shed in the faeces to the environment. Viral spread is faster among dogs in group or shelter dogs than individual animal (3). The cardiac and enteric forms of CPE have been described. The cardiac form is rare though it is possible

in puppies from unvaccinated infected bitch leading to cardiopulmonary abnormalities (18). The enteric form is common and usually severe in unvaccinated and inappropriately vaccinated dogs, however, vaccinated dogs have been reported to come down with the disease (7). Basically, clinical signs include anorexia, fever, vomiting and diarrhoea, which can be haemorrhagic or mucoid with foul smell odour (7, 19). Although, there is paucity of information about the incidence rates of CPE in Nigeria, the recovery of CPV from clinically diagnosed CPE cases can be up to 98.15% (9).

CPE is prevented by vaccination of puppies in a 3 shot series at 3 weeks interval starting from 6 or 8 weeks old (depending on the vaccination status of the dam) followed by annual booster dose (2). In Nigeria, DHLPP vaccine, a five in one vaccine containing attenuated strains of potentially fatal canine diseases including parvovirus (others are canine distemper, hepatitis, leptospirosis and parainfluenza) is used (1). However, it has been reported that some dogs are unable to develop protective immunity after proper vaccination, thus remain susceptible to infection (29). CPE is treated symptomatically and may involve fluid therapy, antibiotic treatment, antiemetic treatment, nutritional support, antiviral treatment and pain management (21). The socioeconomic implications of CPE cannot be overemphasized in Nigeria and several parts of the country including Ilorin, Kwara State. However, there is no published data of CPE prevalence, morbidity rate, mortality rate and case incidence in Ilorin, Kwara State. This retrospective study was done to provide background information for subsequent serologic and molecular studies in the state.

Materials and Method

Study location

Ilorin is the capital of Kwara state and is the most populated part of the state both in human and dog populations. It is located at 8.4799° N, 4.5418° E. Ministry of Agriculture and Natural Resources (MANR) Zonal Veterinary clinic in Ilorin is the first and major clinic attending to veterinary services in Ilorin and neighbouring communities since 1960s and exists as a contribution of the Government to service the public. The clinic was selected because of the year of establishment and good clinical record keeping. The clinic has received both exotic

and local breeds of dogs which are used as pet, security, breeding and or hunting purposes.

Data collection

A retrospective study was carried out with the examination of 4,000 clinical records at the Zonal Veterinary clinic of the Kwara State Ministry of Agriculture and Natural Resources (MANR). All cases from March 2007 to February 2017 were considered with the exclusion of cases on routine deworming, request for vaccination, general check up and request for cosmetic surgeries such as castration, caudectomy, ear notching etc. CPE case selection was based on history, clinical presentation and necropsy findings. Dogs with evidence of one or more of the following were selected: foul smelling diarrhoea, haemorrhagic diarrhoea, diarrhoea and vomiting, and CPE tentative diagnosis. All CPE cases were carefully reviewed considering the history from the first day of registration of the dog at the clinic till the day of recovery or death from CPE. Also, date of presentation, age of dog, number and interval of vaccination shots using DHLPP were noted.

Statistical analysis

Data were entered into SPSS program version 15.0 (2006) for descriptive analysis of variables such as sex, breed, age class, Dog use, vaccination history, treatment outcome, dog's household and number of CPE occurrence/dog.

Result

In the 4,000 clinical records consulted, a total of 1,645 cases were seen out of which 105 cases were CPE given a prevalence of 6.4% in this ten-year study. Figure 1 illustrated the monthly distribution of CPE cases. The highest occurrence of CPE 15.2% (16/105) was recorded in January while the lowest occurrence 1.9% (2/105) was recorded in March. Figure 2 illustrated the yearly distribution of CPE cases. The highest occurrence of 19% (20/105) was recorded in 2013 while the lowest occurrence 0% (0/105) was recorded in 2007. Eighty six (81.9%) dogs with CPE were reported unvaccinated prior to CPE incidence (Table 1). Based on age class, 46 (43.8%) puppies represented the highest occurring class. Majority of the dogs 67 (63.8%) were used for breeding purposes, followed by dogs for security 30 (28.6%) and pets 8 (7.6%). A

total of 28 (26.7%) dogs were reported to recover while 8 (7.6%) reportedly died. Most of the dogs 68 (64.8%) with CPE cases were affected alone, however, multiple CPE cases of 37 (35.2%) were reported in 9 households involving 25 dogs. Out of all the CPE cases,

only 2 (1.9%) dogs had CPE incidence twice. Table 2 showed the number of DHLPP shot received by some of the dogs prior to CPV infection. The interval between the last shot of DHLPP and CPE incidence is also indicated.

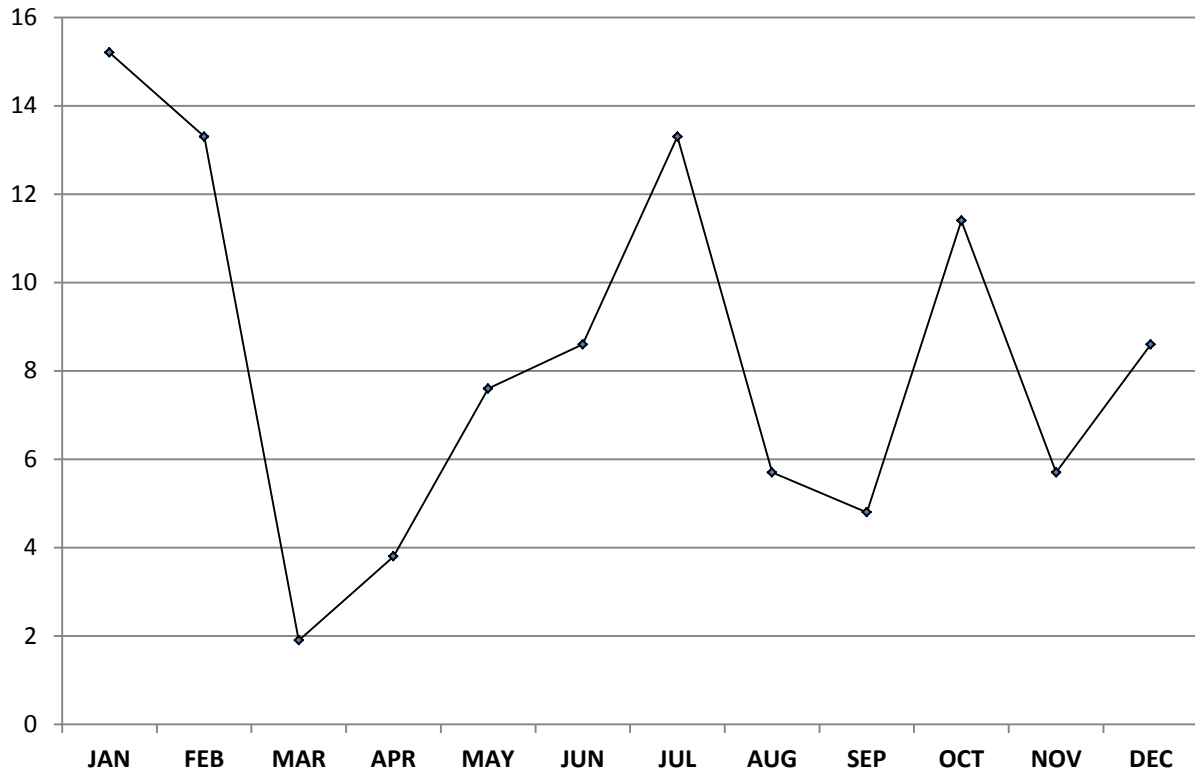
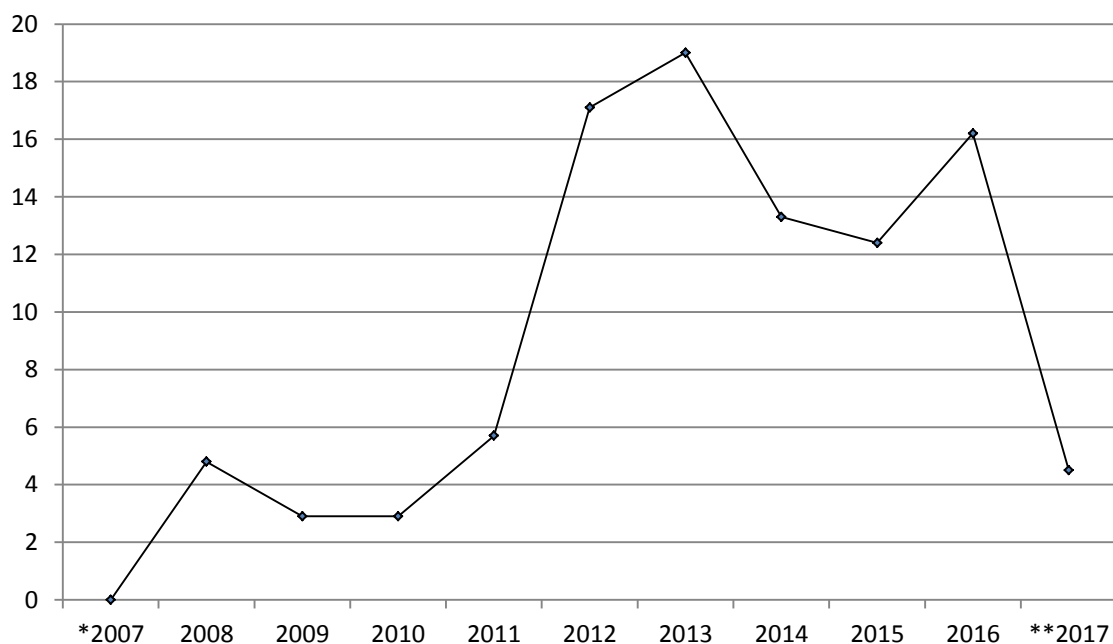


FIG 1: Percentage monthly distribution of CPE cases (2007-2017)



Key: *January and February were not considered **Only January and February were considered

FIG 2: Percentage yearly distribution of CPE cases (2007-2017)

TABLE 1: FREQUENCY AND PERCENTAGE DISTRIBUTIONS OF CPE CASES

Features	Frequency (%)
Sex	
Male	31 (29.5)
Female	38 (36.2)
Unknown	36 (34.3)
Breed	
Alsatian	15 (14.3)
Boerboel	9 (8.6)
Caucasian	1 (1.0)
Rotweiler	9 (8.6)
Terrier	1 (1.0)
Unknown	70 (66.7)
Age class	
Puppy (< 7 months)	46 (43.8)
Adult (≥ 7 months)	36 (34.3)
Unknown	23 (21.9)
Dog use	
Breeding	67 (63.8)
Security	30 (28.6)
Pet	8 (7.6)
Vaccination History (especially with DHLPP)	
Vaccinated	9 (8.6)
Unvaccinated	86 (81.9)
Unknown	10 (9.5)
Treatment Outcome	
Recovered	28 (26.7)
Dead	8 (7.6)
Unknown	69 (65.7)
Dog's household	
Single case of CPE from an household	68 (64.8)
Multiple cases of CPE from household (2-4 cases/household)	37 (35.2)
No. of CPE occurrence/dog	
Once	101 (98.1)
^a Twice	^b 2 (1.9)

^a Percentage considered the total number of dog involved rather than number of CPE cases. One of the dogs was vaccinated after the first CPE incidence while the other was not vaccinated at all.

TABLE 2: VACCINATED DOG WITH CPE INCIDENCE

Dog number tag	Age Class	No. of DHLPP shot received before CPE incidence	Interval between last shot of DHLPP and CPE incidence	Date of case presentation
77	Puppy	1	2 days	01/02/2015
63	Puppy	1	4 days	28/11/2014
99	Puppy	1	^a ≤ 4 weeks	14/06/2016
81	puppy	1	13 weeks	26/09/2014
58	Adult	1	26 weeks	29/10/2012
^b 64b	Puppy	2	4 days	09/02/2015
60	Adult	2	39 weeks	12/11/2008
41	Puppy	3	17 weeks	06/10/2012
91	Puppy	Unknown	^a ≤ 4 weeks	30/11/2016

^a Some weeks ago was recorded (for date of last DHLPP shot)

^b This dog came down with CPE twice within an interval of 60 days. The 2 shots of DHLPP received were within this interval

Discussion

A prevalence of 6.4% was obtained for Canine parvoviral enteritis in the 10-year retrospective study for Ilorin and its surrounding towns. This was lower compared with prevalence of 13.4% reported by Shima et al (25) in Effurun/Warri metropolitan region of Delta State Nigeria. The low prevalence in this study might be due to the

focus on dogs presented at the clinic, more CPE dogs might have been encountered during "house dog services" (ambulatory services), thus the prevalence might even be higher. Lack of record or inadequate record keeping might also be hindrance to computation of the actual CPE prevalence. Three peaks of CPE incidences were observed in this 10-year retrospective study occurring in 2013 (19%), 2016 (6%) and 2008 (5%)

all within 3-5 years intervals (Fig 2). The incidence peaked in January (15%) (Dry season), October (11%) (Dry season) and July (13%) (Rain season) (Fig 1). Varying seasonal CPE incidences have been reported (15, 22, 25) and this might result from varying climatic and geospatial differences. This study showed that Alsatian and boerboel breeds of dog were susceptible to CPV (Table 1). This is in agreement with previous reports (12, 25). Dog breeds such as Doberman Pinschers, Rottweilers and English Springer Spaniels have also been reported susceptible to CPV (13).

The breed susceptibility is still debated as there is no molecular evidence which make one breed easily affected. The prevalence distribution of CPE based on sex and age were not conclusive because of unclassified (unknown) variable. However, this report (Table 1) was in agreement with other studies (4, 5, 12, 25), that puppies are more susceptible than the adult dogs. Adult dogs might be less susceptible because of the presence of protective antibody acquired from vaccination or exposure to field virus obtainable from the contaminated environment. This study showed that dogs use for breeding purposes 67 (63.8%) were more affected compared to dogs used for security and pet purposes. This high susceptibility might result from increase number of contact with other dogs (bitch) needed to be bred. Male dogs are known to sniff around the perineal region of bitch during pre-copulatory activity (15, 27), thereby increasing risk of faeco-oral transmission of CPV. Dogs use for security tends to have more dog-dog contact compared with pet dogs. An interesting observation in this study was that 37 (35.2%) of CPE cases involved dogs from the same households (n= 9) with 2- 4 cases/household (Table 1). This supported the report that CPV is easily transmitted in dogs in group than in single confinement (3). Nosocomial infection is very high in animal shelter, Veterinary hospital and clinics with poor hygiene management system. The study also revealed that most of the CPE case occurred once per dog (n= 101; 98.1%) throughout the 10-year study though with an exception of 2 dogs which had a repeated occurrence. This is in agreement with report that dogs which were properly vaccinated or recovered from CPE were less likely to

develop CPE within a year post-vaccination/post-recovery. The treatment outcome indicated that recovery rate was high (n=28; 26.7%).

However, unreported treatment outcome in this study suggested these dogs were either not presented for follow up or dead. Early diagnosis and treatment of CPE cases have been reported to reduce mortality rate (18, 23). CPE unvaccinated dogs (n= 86; 81.9%) represented the mostly affected and the vaccinated dogs (n= 9; 8.6%) were least affected. Unvaccinated dogs are prone to infection because of lack of protective humoral and cell mediated immunity targeted against CPV infection (19). This study gave an insight to vaccine failure against CPV infection which is common in small animal practise. Three puppies (dog tag number: 77, 63 & 99) and one adult dog (dog tag number: 58) (Table 2) that were administered one shot of DHLPP vaccine came down with CPE 2-28 days and 26 weeks post vaccination respectively. Dogs that received 2-3 shots of DHLPP (dog tag number: 64b, 60 & 41) came down with CPE 0.6-39 weeks post vaccination. Majority of dogs that came down with CPE after vaccination were puppies (7/9; 77.8%). Maternally-derived CPV antibody has been described to offer protection against CPV infection for several weeks in puppies. However, none of the developed vaccines including killed, attenuated, modified live, recombinant, DNA or peptide vaccine has been found to confer adequate protective immunity in the presence of maternally-derived antibody, thus resulting into vaccine failure (10, 11, 14, 16). The susceptibility in these puppies might have resulted from antigen-antibody complex formation between vaccine (antigen) and maternally-derived antibody leaving these puppies unprotected from field virus which is endemic and at its peak in the study area (Figure 1&Table 2). Furthermore, a puppy rottweiler breed (dog tag number: 64b) which was vaccinated with first and second shots of DHLPP at days 47 and 55 (8 days interval) respectively after CPE infection came down with the same disease 4 days after the second DHLPP shot (Table 2). It is possible that the first and second shots of DHLPP administered mop up the antibody developed after the first field CPV challenge. Other suggested causes of

vaccine failure could include immune system incompetence (immunosuppression, poorly developed immune system), inconsistent vaccine quality and CPV variant seeds (ineffective vaccine load, inability to maintain cold chain, use of geographically incompatible CPV variant as seed in development of vaccine), human error (vaccine administration at inappropriate interval, inadequate record keeping and follow up by dog owners) and lack of accessible and affordable diagnostic technique to check CPV antibody titer before vaccination (22, 24, 28).

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