



## Prevalence of canine parvoviral enteritis in Yola metropolitan region of Adamawa State, Nigeria

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**Publication History:**  
Received: 25-03- 2019  
Accepted: 18-06-2019

### Abstract

Canine parvoviral enteritis (CPE) causes severe clinical disease with high morbidity and mortality in puppies less than 5 months of age and adult dogs with insufficient immunity. Nine-year (2010-2018) data were collated and analyzed on clinical records of dogs infected with CPE in Yola metropolis. Out of 2,220 dogs presented, 177 were diagnosed infected with CPE giving an overall prevalence of 7.97% (95% CI: 6.85-9.05). The annual highest prevalence of 20.59% (95% CI: 16.98-24.65) was recorded in 2018 with 90 cases and lowest prevalence of 1.12% (95% CI: 0.00-2.79) was recorded in 2011 with 2 cases. Based on season, highest prevalence of 16.38% (95% CI: 11.82-21.31) was recorded in December with 38 cases while lowest prevalence of 1.64% (95% CI: 0.00-3.65) was recorded in October with 3 cases. Both annual and monthly prevalence rates varied significantly ( $P < 0.05$ ). Age distribution showed higher prevalence in puppies less than 5 months (8.81%) followed by dogs of 6-11 months (7.25%) and least in dogs older than one year (5.42%). Female dogs were observed to be more affected (8.34%) than male dogs (7.69%). The observed breed prevalence shows highest occurrence in Alsatian (10.11%), followed by Local dogs (8.10%), Rottweiler (6.20%) and Caucasian (5.83%) with least prevalence in Cross breeds (4.39%) with significant statistical difference ( $X^2 = 11.869$ ,  $P < 0.05$ ). The prevalence of CPE was observed to be higher in unvaccinated (8.73%) than in vaccinated dogs (6.99%). There was no significant association observed between CPE with age, sex and vaccination status ( $P > 0.05$ ). It was concluded that CPE is endemic and widespread in Yola metropolis. Therefore, the need for vaccination of dogs and investigation into the potency of vaccines currently used in the study area were recommended.

**Keywords:** Adamawa State, Canine parvovirus, Enteritis, Prevalence, Yola

### Introduction

Canine parvoviral enteritis (CPE) is the cause of highly contagious acute enteritis associated with high mortality and morbidity with very low survival rates

in untreated dogs (Mylonakis *et al.*, 2016). It causes severe clinical disease in puppies less than 5 months of age and adult dogs with insufficient immunity

(Sykes, 2014; Mylonakis *et al.*, 2016). Canine parvoviral enteritis is caused by three variants of canine parvovirus type-2 (CPV2a, CPV2b and CPV2c) which are the leading cause of morbidity and mortality worldwide and are thought to have similar pathogenicity leading to indistinguishable clinical disease with broader host range (Goddard & Leisewitz, 2010; Marcovich *et al.*, 2012).

Canine parvovirus is a contagious viral disease of dogs characterised by vomiting, foul-smelling diarrhea ranging from mucoid to hemorrhagic, dehydration, fever, lethargy, myocarditis, hypoglycaemia and leucopenia (Streck *et al.*, 2009; Mylonakis *et al.*, 2016). The incubation period following experimental or natural exposure ranges from 4 to 14 days and shedding of the virus commences few days prior to the occurrence of clinical signs (Sykes, 2014; Mylonakis *et al.*, 2016). The transmission of parvovirus infection is basically by direct contact with infected dogs or indirectly by contact with contaminated faecal materials (Sykes, 2014). The virus has the capacity to infect the epithelial cells of the intestinal wall and consequent sloughing off of the mucosal wall of the intestine if nothing is done to curb the disease in the affected animal (Ogbu *et al.*, 2016).

Canine parvoviral enteritis presents clinical signs that are similar to those of other causes of acute gastrointestinal disorders, including canine distemper infection and other viral enteritis, hemorrhagic gastroenteritis, enteric bacterial infections such as salmonellosis, acute pancreatitis, hypoadrenocorticism, inflammatory bowel disease, intestinal intussusception, gastrointestinal foreign bodies and various intoxications (Mylonakis *et al.*, 2016). Therefore, clinical diagnosis of CPE necessitates the combination of clinical and clinicopathological abnormalities along with the detection of the viral antigen using polymerase chain reaction (PCR) (Mylonakis *et al.*, 2016). The diagnosis using PCR is highly recommended on faecal samples, in addition to histopathology and immunohistochemistry on necropsy specimens. However, in a poor resource setting, a rapid CPE antigen test kit may be employed especially in dogs showing evidence of diarrhoea (Nahat *et al.*, 2015). Treatment for CPE is largely supportive and symptomatic. The principal components of treatment include fluid therapy with 5% dextrose saline or lactated ringers solution depending on the severity of dehydration. Antibiotic treatment (Ampicillin 20-40mg/kg IM, Gentamycin 4.4mg/kg IM); antiemetics (Metoclopramide 0.2-0.4mg/kg IV; Chlorpromazine

0.5mg/kg IV) and nutritional support have proved effective in lowering mortality (Mylonakis *et al.*, 2016). Survival rate of infected dogs may be as low as 9% if no treatment is undertaken, but aggressive treatment will lower mortality to 4% - 48% (Folitse *et al.*, 2017). Effective immunization with polyvalent vaccine is essential for the protection of the individual dog (Mylonakis *et al.*, 2016).

Canine parvoviral enteritis has been reported and documented in southern and central parts of Nigeria (Chollom *et al.*, 2013; Shima *et al.*, 2015; Apaa *et al.*, 2016; Ogbu *et al.*, 2016; Gberindyer *et al.*, 2017). However, there was paucity of information on the disease in northeastern part of Nigeria more especially in Adamawa State despite the economic significance of the disease in dogs. The present study was undertaken to assess the several cases of mortality and morbidity due to CPE most tentatively diagnosed based on clinical signs of vomiting, foul-smelling diarrhea and dehydration in both vaccinated and unvaccinated dogs as well as to provide documented evidence of CPE in the study area.

## Materials and Methods

### Study area

The study was conducted in Yola metropolis of Adamawa State, Nigeria which lies within 7°0'0" and 11°0'0"N and within 9°0'0' and 13°0'0'E. (NPC, 2016). Adamawa is bordered by the states of Borno to the northwest, Gombe to the west and Taraba to the southwest. The metropolis has a considerable number of dog population. The common dog breeds seen in the area are indigenous/local and exotic breeds with many of them kept mostly for companionship as pets, security and for livelihood or commercial gains by dog breeders.

### Data collection

A 9-year (2010-2018) data was collated on tentatively diagnosed cases of CPE from clinical records of dogs presented at Jambutu Veterinary Clinic in Yola metropolis. Data were abstracted by carefully reviewing the case records. Selection of cases was based on history, clinical signs and tentative diagnosis of CPE recorded. Age, sex, breed and vaccination status of each dog as well as month and year, when diagnosis was made were recorded. The vaccination history was categorized into two, namely vaccinated and unvaccinated. Most of the dogs admitted in the clinic were from within the Yola metropolis.

### Data analysis

Data collected were analyzed using Statistical Package for Social Sciences (SPSS) version 2.0 Test of

Association between canine parvoviral enteritis and age, sex, breed and vaccination status was measured using Chi-square ( $X^2$ ) analysis at 95% confidence interval and the value of  $P < 0.05$  was considered statistically significant.

**Results**

Data collated for nine years (2010-2018) for CPE in Yola metropolis, Adamawa State are shown in Figure 1. A total of 2,220 dogs presented with different health challenges revealed 177 (7.97%) dogs with haemorrhagic diarrhea or anorexia with or without vomiting considered to be infected with canine parvoviral enteritis according to clinical diagnosis. The prevalences were observed to increase exponentially from 1.21-7.60% (2011-2013), decreases from 7.25-3.02% (2014-2015) and then rise from 5.02-20.59% (2016-2018) with highest value of 20.59% (95% CI: 16.98-24.65) recorded in 2018.

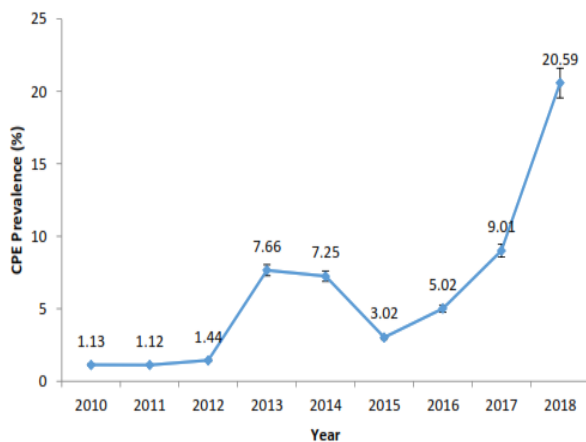
Canine parvoviral enteritis was observed to affect dogs all year round (Figure 2). Highest prevalence of 16.38% (95% CI: 11.82-21.31) was recorded in dry season (December) and lowest prevalence of 1.64% (95% CI: 0.00-3.65) was recorded towards the end of rainy season (October). The annual and monthly prevalence rates varied significantly ( $P < 0.05$ ).

The distribution of CPE cases by age, sex, breed and vaccination status is shown on Table 1. Age distribution of dogs presented with CPE showed higher prevalence in puppies less than 5 months (8.81%) followed by dogs of 6-11 months (7.25%) and least in dogs older than one year (5.42%). Female dogs had been observed to be more affected with CPE (8.34%) than male dogs (7.69%). The observed breed

prevalence shows highest occurrence in Alsatian (10.11%), followed by Local dogs (8.10%), Rottweiler (6.20%) and Caucasian (5.83%) with least prevalence in Cross breeds (4.39%) with significant statistical difference ( $X^2 = 11.869$ ,  $df = 4$ ,  $P < 0.05$ ). The prevalence of CPE was observed to be higher in unvaccinated (8.73%) than in vaccinated dogs (6.99%). Insignificant association was observed between CPE with age, sex and vaccination status ( $P > 0.05$ ).

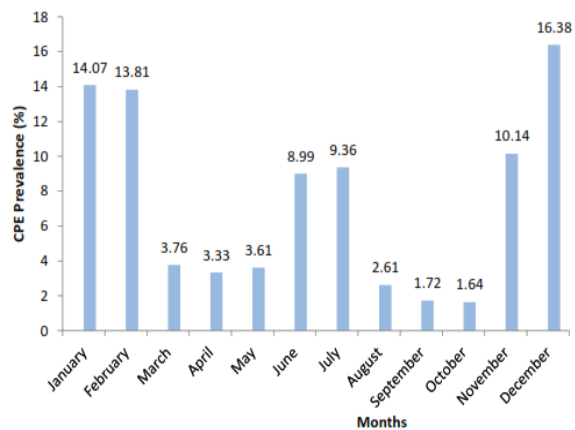
**Discussion**

Canine parvoviral enteritis (CPE) has been documented as one of the most common infectious disorders and prevalent viral infections causing haemorrhagic diarrhea in puppies with high morbidity and mortality (Greene & Decaro, 2012). The present study revealed an increased endemicity of CPE with an estimated average prevalence of 7.79% (177/2220). The finding is lower than previous reports; 13.4% (Shima *et al.*, 2015) in Effurun/Warri metropolis, Delta State and 61.0% (Adejumobi *et al.*, 2017) in Ibadan, Oyo State. Chollom *et al.* (2013) also reported 47.7% prevalence in Jos, Plateau State using PCR. Higher prevalence of CPE was reported in other parts of the world (Gombac *et al.*, 2008; Mcree *et al.*, 2014; Reddy *et al.*, 2015; Foltise *et al.*, 2017). From this finding, CPE has been observed to be in a state of increase from 1.12% in 2011 to 20.59% in 2018; this suggests that, the disease is endemic and widespread despite aggressive vaccination with the available vaccines (Decaro *et al.*, 2006). The increase in prevalence of CPE in the study area may be connected to the increase influx of unvaccinated or



$X^2 = 140.995$   $df = 8$   $P = 0.001$

**Figure I:** Yearly prevalence of canine parvoviral enteritis in dogs in Yola metropolis



$X^2 = 82.667$   $df = 11$   $P = 0.001$

**Figure II:** Average monthly distribution of canine parvoviral enteritis in dogs in Yola metropolis

**Table 1:** Distribution of dogs with CPE based on age, sex, breed and vaccination status

Variables	No of dogs	No infected	Prevalence (%)	95% CI	X <sup>2</sup>	P-value
<b>Age (Months)</b>						
< 5	1272	112	8.81	7.36-10.51	3.538	0.170
6-11	745	54	7.25	5.53-6.33		
>12	203	11	5.42	2.55-8.72		
<b>Sex</b>						
Male	1249	96	7.69	6.25-9.39	0.320	0.572
Female	971	81	8.34	6.65-10.00		
<b>Breed</b>						
Local dogs	894	72	8.05	6.37-9.87	11.869	0.018
Alsation	752	76	10.11	8.08-12.47		
Caucasian	103	6	5.83	1.19-10.78		
Rottweiler	129	8	6.20	2.44-10.79		
Cross breeds	342	15	4.39	2.34-6.67		
<b>Vaccination Status</b>						
Vaccinated	972	68	6.99	5.48-8.70	2.250	0.134
Unvaccinated	1248	109	8.73	7.07-10.41		
<b>TOTAL</b>	<b>2,220</b>	<b>177</b>	<b>7.97</b>	<b>6.85-9.05</b>		

incompletely vaccinated exotic dogs more especially puppies from various part of the country. In the process, such dogs may harbour the virus and serve as a source of infection or transmission to susceptible ones. The inability of both public and private owned clinics to observe good sanitary practice of regular disinfection of premises, equipments and examination tables is also a factor and such infected and contaminated items may likely be a medium for other susceptible dogs to contact the infection (Greene & Decaro, 2012; Mylonakis *et al.*, 2016).

Monthly distribution of CPE shows that the disease occurred almost all year round. The highest number of cases occurring in the dry season between the months of November and February and during rainy season between the months of June and July, with peaked value recorded in December. Similarly, lower number of cases were recorded between the months of March and May as well as August and October with minimum number of cases recorded in October. Similar pattern was also reported in other parts of Nigeria (Shima *et al.*, 2015; Adejumobi *et al.*, 2017). This result, however, contrasts the findings of Tagorti (2018) who reported higher number of cases between the months of September and November. Canine parvovirus being a non-enveloped virus has been reported to be resistant to environmental influences; hence, seasonal variations in the pattern of the disease may not be related to climate but rather to the breeding season of dogs (Greene & Decaro, 2012; Sharma *et al.*, 2016). The persistence of CPE throughout the season points to the fact that more need to be done by veterinary personnel and dog owners in curbing this menace in this part of the country.

Regarding the age, this study highlighted that infection with CPE is more common in puppies less than 5 months old and this corroborates with the earlier findings (Shima *et al.*, 2015; Adejumobi *et al.*, 2017). Similar findings were also reported in other countries (Umar *et al.*, 2015; Hassan *et al.*, 2017; Folitse *et al.*, 2017; Tagorti, 2018). It has been postulated that puppies obtained maternal antibodies from the bitch through colostrum which confers protection from CPE during their early phase of life. When the immune status of the bitch has been interfered with or there is improper vaccination protocol, this will consequently result into vaccine antigen neutralization and vaccine failure leading to outbreak of the disease (Singh *et al.*, 2013; Umar *et al.*, 2015).

With regard to sex, female dogs had higher prevalence than male. This agreed with the report of Umar *et al.* (2015) and Adejumobi *et al.* (2017) who reported female susceptibility of 58.5% and 52.0% respectively. However, the present study contrasts the reports of Shima *et al.* (2015); Folitse *et al.* (2017) and Tagorti (2018) who found male dogs to be more susceptible than female. There is no significant difference in exposure to infection with CPE in both sexes. We can thus hypothesize that exposure of dogs to the virus is not influenced by gender but that both sexes had equal chance of contracting the disease.

The present study shows that CPE is present in almost all breeds of dogs in the study area with significant statistical difference. The increased in susceptibility of local dogs (mongrel) to CPE as noted in this study indicates that the disease has gotten an emerging status and can be source of infection to other more susceptible exotic breeds (Reddy *et al.*, 2015). The present finding contrast

earlier reports (Shima *et al.*, 2015; Ogbu *et al.*, 2016; Adejumbi *et al.*, 2017) that postulated local breeds to be less susceptible to CPE.

The results of vaccination status indicated a higher percentage of positive cases in unvaccinated dogs than in vaccinated dogs. This corresponds with earlier reports (Shima *et al.*, 2015; Ogbu *et al.*, 2016; Folitse *et al.*, 2017; Tagorti, 2018). The higher number of CPE cases observed in unvaccinated dogs suggests a known hypothesis that, local dogs are less susceptible to infection with CPE. Hence, the attention of most dog owners and veterinarian were geared towards protecting exotic breeds than the indigenous ones. The substantial percentage of CPE cases observed in vaccinated dogs suggests that, the dogs lack adequate protection from the virus. Ignorance on the part of dog owners to strictly observed routine vaccination, unavailability of vaccines, break in cold-chain that renders the vaccines inefficacious, improper handling and administration of the vaccines among other factors all played a role in the observed high prevalence (Decaro *et al.*, 2007; Singh *et al.*, 2013). The vaccination protocol being used in the study area make use of recombinant vaccine DHLPP (canine distemper, canine hepatitis, leptospirosis, canine parvovirus and parainfluenza virus), a foreign based vaccine which contains inactivated canine parvovirus and is administered at 5-6 weeks of age and two booster doses given at 2-4 weeks interval for adequate immune response. Inadequate vaccination dosages had been reported as a factor to high prevalence of CPE in vaccinated dogs as they were not adequately protected in life (Decaro *et al.*, 2007; Shima *et al.*, 2015).

The number of CPE cases reported in this study might have been higher, but due to inadequate record keeping in the government and private owned veterinary clinics, inappropriate reporting by private veterinarians and paraveterinarians, high cost of treatment, as well as grave prognosis of CPE cases might have resulted in its low documentation. It is pertinent to note that, true CPE prevalence value should involve faecal detection of the virus using rapid antigen detection kit and polymerase chain reaction (PCR), these tools were not engaged in this study. Therefore, our findings are likely to be at variance with true prevalence and should be interpreted with caution.

In conclusion, this study has demonstrated an all year round endemic and widespread nature of CPE in the study area. The susceptibility of local breeds (mongrel) to the infection indicates that the disease is emerging.

We therefore recommend the need for aggressive vaccination of dogs irrespective of breed; investigation into the potency of available DHLPP

vaccines currently used in the study area; and further studies to be carried out on detection of the virus in suspected dogs in the study area.

#### Acknowledgement

The authors acknowledged the Divisional Veterinary Officer, Yola North for allowing us free access to the clinics record; and Mr. Philip Hassan Jalo of Intercountry Centre for Oral Health for Africa (ICOH) Jos, for statistical analysis of the data.

#### Conflicts of Interest

The authors declare no conflicts of interest.

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