

RETROSPECTIVE STUDY OF CANINE PARVOVIRAL ENTERITIS IN VETERINARY TEACHING HOSPITALS IN SOUTH EAST, NIGERIA

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ABSTRACT

Canine parvoviral enteritis (CPE) is endemic disease of dogs younger than six months of age and immune compromised adult dogs. A retrospective study was conducted on tentatively diagnosed cases of CPE from clinical case records of dogs presented to Veterinary Teaching Hospitals, in South East, Nigeria for a period of 10 years (2011 – 2020). A total of 1647 dog cases were reviewed with overall prevalence of 117 (7.1 %). Age, sex and breed did not show any association with the occurrence of CPE, while vaccination, survivability, location, year, month and season showed association with the occurrence of CPE. High prevalence was recorded in 2018 (13.1 %), 2019 (9.0 %) and 2020 (13.9 %), while the low prevalence was recorded in 2011 (1.3 %), 2013 (5.8 %) and 2015 (4.6 %). High prevalence was observed during the dry season months of January and February, while the wet season months of September and October had low prevalence. Boerboel, Caucassian and Toy breed were the most frequently affected. It was concluded that CPE is endemic in South Eastern Nigeria with all year round occurrence and unvaccinated dogs and puppies were more at risk. Aggressive vaccination of dogs with homologous vaccine containing the field strain is highly recommended for complete protection.

Keywords: Retrospective study, Prevalence, Risk factors, Canine parvoviral enteritis, South East

INTRODUCTION

Canine parvoviral enteritis (CPE) is one of the most common causes of morbidity and mortality in younger dogs less than six months. The disease occurs worldwide and is caused by Canine parvovirus type 2 (CPV-2) (Mylonakis *et al.*, 2016). CPV-2 alongside with Feline panleukopenia virus (FPV), Mink enteritis virus (MEV) and Raccoon parvovirus (RPV) belong to genus *Parvovirus* (Tattersall *et al.*, 2005).

Canine parvovirus infection is endemic in most populations of domestic and wild carnivores (Carmichael, 2005; Touihri *et al.*, 2009). The disease was first reported in the USA in early 1978 (Meunier *et al.*, 1985), but the identification of the causative virus was first documented as CPV-2 in Canada in June 1978 (Appel *et al.*, 1979). CPE is highly contagious and is transmitted by direct and indirect contact with contaminated faeces, bedding or fomites (Appel *et al.*, 1979).

The most characteristic clinical form of canine parvoviral enteritis is manifested as haemorrhagic enteritis and myocarditis in puppies, the extent of which is dependent on the maternally derived antibody (MDA) titres of the infected puppies at the time of infection (Decaro and Buonavoglia, 2012). Clinical signs occur after an incubation period of 3 – 7 days and consist of anorexia, depression, vomiting, mucoid or bloody diarrhoea, frequent dehydration, fever and myocarditis (Streck *et al.*, 2009). The mortality can be as high as 70 % in puppies and usually less than 1 % in adult dogs (Decaro and Buonavoglia, 2012). Aggressive and prompt management can reduce the mortality rate in puppies to 9.0 % (Mylonakis *et al.*, 2016). The predisposing factors associated with the development of clinical parvovirus enteritis include; stress factors such as weaning, overcrowding, parasite load, insufficient passive or active immunity, geographical area and the presence of co-infections with canine coronavirus and intestinal parasites (Goddard and Leiswits, 2010; Kalli *et al.*, 2010). Treatment of CPE is mainly supportive and aimed at alleviating the clinical signs of disease (Savigny and Macintire, 2010). The restoration of fluid volume and electrolyte balance is very important, especially in puppies that have had severe vomiting and diarrhoea.

Canine parvoviral enteritis has been well reported and documented in several part of the Nigeria, including south eastern part of the country (Shima *et al.*, 2015; Apaa *et al.*, 2016; Ogbu *et al.*, 2016; Ukwueze *et al.*, 2018). However, there seems to be paucity of information on retrospective cases of CPE in the Veterinary Teaching Hospitals (VTHs) in the study area. Thus this study was designed, to assess the retrospective cases and risk factors associated with the occurrence CPE presented to VTHs in South East, Nigeria.

MATERIALS AND METHODS

Study Area: The study was conducted in two Veterinary Teaching Hospitals in South East, Nigeria namely Michael Okpara University of Agriculture Umudike, Veterinary Teaching Hospital (MOUAVTH) and University of Nigeria

Nsukka, Veterinary Teaching Hospital (UNN VTH) located in Abia and Enugu States respectively. Abia State is located on latitude 5°25'N, longitude 7°30'E and it occupies a total land mass of 6,320 km². According to the National Population Commission the State has a projected population of about 3,841,943 persons with a population density of about 650 persons per square kilometre (Wikipedia, 2022). It is bounded on the north and north-east by Anambra, Enugu and Ebonyi States, to the east and south-east by Cross River and Akwa Ibom States, to the south by Rivers State and to the west by Imo State.

Enugu State is located between latitude 6°30'N, longitude 7°30'E and it occupies a total land area of about 7,161 Km². According to the National Population Commission the State has a projected population of about 4,396,098 with a population density of about 460 persons per square kilometre (Wikipedia, 2022). It is bounded in the south by Abia and Imo States, in the east by Ebonyi State, in the north-east by Benue State, in the north-west by Kogi State and in the west by Anambra State.

The study areas have a relatively high dog population and breeds commonly seen are exotic, mixed breeds and Nigerian local breeds (mongrels) with many of them kept mostly for as pets, security or sentinel by companies and individuals, and for livelihood or commercial gains by dog breeders.

Data Collection: Retrospective study was conducted on suspected cases of CPE from clinical case records of dogs presented to MOUAVTH and UNN VTH for a period of 10 years (2011 – 2020). Data were extracted by carefully reviewing the case records. Selection of cases was based on history, clinical signs and in some instances diagnosis made with rapid test kit known as Immunochromatographic IC test. Dogs with clear history of foul smelling diarrhoea, haemorrhagic diarrhoea and positive IC test were selected. The risk factors considered in the study were age, sex, breed, month, year, vaccination status and survivability.

Data Analysis: Data collected were analysed using Statistical Package for Social Sciences (SPSS) version 2.0 with descriptive statistics and Chi-square (χ^2). Test of association with the variables were measured with the Chi-square (χ^2) and the value of $p < 0.05$ was considered statistically significant.

RESULTS

A total of 1647 dog cases were reviewed with overall prevalence of 117 (7.1 %). The distribution of CPE in relation to age, sex, vaccination status, survivability and location indicated that age and sex had no association with the occurrence of CPE, while vaccination, survivability and location had association with the occurrence of CPE (Table 1).

(6.4 %), and Bull mastiff (6.2 %), while Pit bull, Great dane and St. Bernard had (0 %) prevalence each (Figure 1). The monthly prevalence showed association ($\chi^2 = 27.305$ df = 11 P = 0.004) with the occurrence of CPE and the highest occurrence was observed in January (14/144) and February (14/98) (dry season), while the lowest prevalence was observed in September (2/107) and October (3/116) (raining season) (Figure 2). Yearly prevalence showed association ($\chi^2 = 26.314$, df = 9, p = 0.002) with the occurrence of CPE. The highest prevalence was recorded in 2018 (11/84, 13.1 %), 2019 (12/133, 9 %) and 2020 (5/36, 13.9 %), while the lowest prevalence was recorded in 2011 (2/153, 1.3 %), 2013 (12/207, 5.8 %) and 2015 (12/257, 4.6 %) respectively (Figure 3).

Table 1: Distribution of canine parvoviral enteritis cases in relation to age, sex, vaccination status, survivability and location

Variables	Number of dogs sampled	Number of dogs infected	Prevalence (%)	χ^2	df	P-value
Age(months)						
0 – 6	982	81	8.20	4.99	2	0.08
7 – 12	417	24	5.80			
>12	248	12	4.80			
Sex				0.18	1	0.67
Male	771	57	7.40			
Female	876	60	6.80			
Vaccination status				8.93	2	0.01
Vaccinated	862	47	5.50			
Unvaccinated	774	68	8.80			
Unknown	11	2	18.20			
Survivability				50.99	2	0.00
Survived	493	39	7.90			
Dead	73	20	27.40			
Unknown	1081	58	5.40			
Location				23.85	1	0.00
MOJAU	454	55	12.10			
UNN	1193	62	5.20			

Distribution of CPE in relation to breed, months and seasons of the year are shown in Figures 1 – 3. Breed prevalence did not show any association ($\chi^2 = 4.871$ df = 9 P = 0.845) with the occurrence of CPE. Boerboel (12.5 %), Caucassian (8.3 %) and Toy breed (7.1 %) had the highest prevalence, followed by German shepherd (6.9 %), Mongrel (6.4 %), Rottweiler

DISCUSSION

Canine parvoviral enteritis (CPE) remains a life threatening condition found in dogs, commonly associated with vomiting and diarrhoea, which culminates in dehydration, shock and death without aggressive fluid therapy (Shima *et al.*, 2015; Mazzaferro, 2020). In this study overall prevalence of 7.1 % was observed. The result was similar to reports of previous workers (Daodu and Ajiboye, 2018; Francis *et al.*, 2019), who observed a prevalence of 6.4 % and 7.97 % in Ilorin North Central, Nigeria and Yola

metropolitan region of Adamawa State Nigeria respectively. Higher prevalence of 13.4 % was reported in Effurun/Warri metropolis, Delta State (Shima *et al.*, 2015), 61.0 % in Ibadan, Oyo State (Adejumobi *et al.*, 2017), 47.7 % in Jos, Plateau State and 17.14 % in South Eastern, Nigeria (Ukwueze *et al.*, 2018).

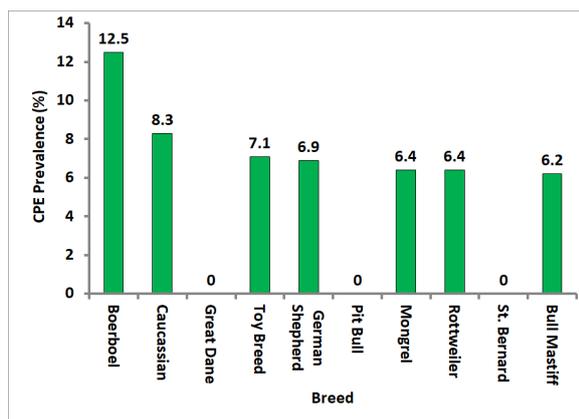


Figure 1: Breed distribution of canine parvoviral enteritis in Veterinary Teaching Hospitals South East, Nigeria

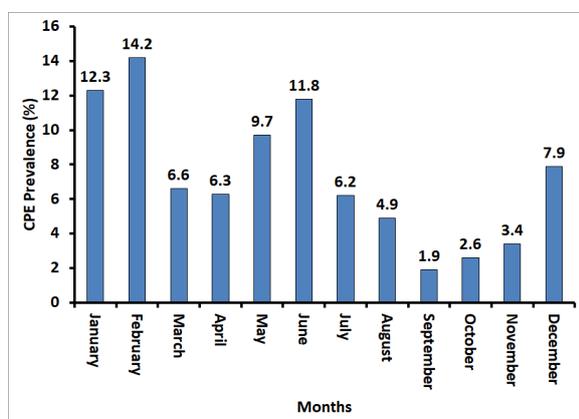


Figure 2: Monthly distribution of canine parvoviral enteritis in Veterinary Teaching Hospitals South East, Nigeria

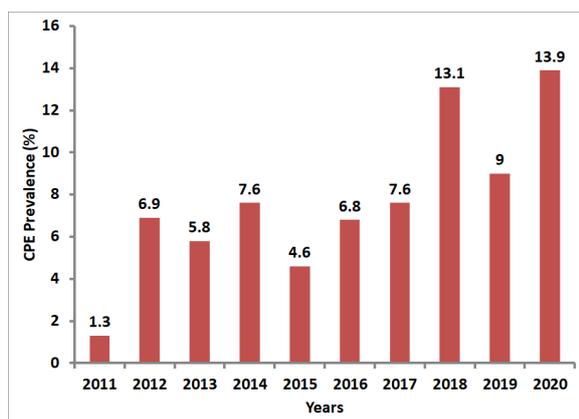


Figure 3: Yearly distribution of canine parvoviral enteritis in Veterinary Teaching Hospitals South East, Nigeria

The lower prevalence observed in this study may be attributed to limited sampled population, because the study focused on dogs presented in VTHs of the two institutions. Also inadequate record keeping and poor documentation of cases might be a factor that

can also lead to the lower prevalence observed in this study.

According to age distribution CPE was reported to be higher in puppies 0 – 6 months (8.2 %), older dogs 7 – 12 months (5.8 %) and above one year (4.8 %) was in agreement with other studies (Shima *et al.*, 2015; Adejumobi *et al.*, 2017; Ukwueze *et al.*, 2018; Francis *et al.*, 2019). This result also corroborated the findings from other parts of the world (Umar *et al.*, 2015; Folitse *et al.*, 2017; Hassan *et al.*, 2017; Tagorti, 2018). A study in Slovenia indicated very high mortality due to CPE in puppies (67.6 %) less than six months, (27.5 %) mortality in older dogs and very low mortality of (6.8 %) in dogs older than one year (Gombač *et al.*, 2008). Castro *et al.* (2007) and Cubel Garcia *et al.* (2014) in a similar study showed that puppies of 2 – 4 months were at higher risk than older dog. This susceptibility of puppies may be due to poor immune status of dam and lack of Maternally Derived Immunity (MDI) in puppies or improper timing of vaccination in puppies with MDI resulting in CPV vaccine antigen neutralization and vaccine failure (Pollock and Carmichael, 1982).

Higher incidence was recorded in the male (7.4 %) compared to female (6.8 %), although sex had no influence in occurrence of CPE in this study. The result was in agreement with previous studies (Castro *et al.*, 2007; Ukwueze *et al.*, 2018; Francis *et al.*, 2019), who reported that sex had no influence in exposure to CPE infection. The result further corroborated the findings of Shima *et al.* (2015) and Tagorti (2018) who reported higher susceptibility of male than female. It however, contradicts the findings of Adejumobi *et al.* (2017) and Francis *et al.* (2019) who reported a higher susceptibility of females than males to CPE infection. It can also be inferred from this study that CPE infection was not sex dependent, as male and female dogs had equal opportunity of contracting the disease.

In this study, vaccination influenced the occurrence of CPE, with the incidence being higher in the unvaccinated dogs (8.8 %) than the vaccinated dogs (5.5 %), which corroborated with previous studies (Shima *et al.*, 2015, Tagorti, 2018; Francis *et al.*, 2019).

The higher incidence observed in the unvaccinated dogs may be attributable to poor immune response and lack of protection from the virus, which may be due ignorance on the part of the owner, cost of vaccination, poor husbandry and inadequate biosecurity (Nakamura *et al.*, 2004). CPE cases observed in the vaccinated dogs may be attributed to vaccine failure or inadequate vaccination (incomplete vaccination), breakdown in cold chain, improper handling and administration of the vaccines (Decaro *et al.*, 2007; Francis *et al.*, 2019). Mutation and antigenic variations of CPV-2 has also been reported as huge factor in outbreaks of CPE in vaccinated dogs. Most recent studies on CPV-2 in Nigeria and several part of the world have reported CPV-2c as the most predominate, whereas most of the vaccine strains used are either CPV-2a or 2b and some of the original strain of the virus CPV-2 before first ever mutation (Fagbohun and Omobowale, 2018; Ukwueze *et al.*, 2020). Several studies have argued on the effectiveness of cross protection of immunity as fully vaccinated adult dog got infected with 2c strain of the virus (Decaro *et al.*, 2009; Castro *et al.*, 2011; Filipov *et al.*, 2011). Immunity induced by CPV-2 vaccines is effective against the homologous (vaccine) virus but significantly lower against the antigenic variants, thus allowing an aggressive strain to cause infection and even mortality in dogs (Pratelli *et al.*, 2001; Decaro and Buonavoglia, 2012).

The survivability showed association with the occurrence of CPE, with 7.9 % survival and 27.4 % mortality. Treatment and clinical management of CPE, to a large extent requires some rigorous care and aggressive therapy, and the success depends on how early the disease is diagnosed, age of the dog and immune status ((Prittie, 2004; Mylonakis *et al.*, 2016). The high mortality rate observed in this study was in agreement with Otto *et al.* (1997), and Mylonakis *et al.* (2016), who stated that mortality rate can be as high as 80 % if no treatment was instituted, but may be as low as 9 % with treatment and good nursing care. Location had association with the occurrence of CPE with MOUAU (12.1 %) and UNN (5.2 %). The variation in location may be due to poor

case reporting in some government veterinary hospitals due to perceived poor prognosis of the disease and lack of willingness on the part of the owners to give their pets' adequate veterinary care. The yearly distribution indicated association with the occurrence of CPE in this study. The highest prevalence occurred in 2020 (13.9 %) and 2019 (13.1 %), while the lowest prevalence was observed in 2011 (1.3 %) and 2015 (4.6 %), respectively. This result was in agreement with the findings of Decaro *et al.* (2006) that reported that CPE is endemic and wide spread despite aggressive vaccination.

The study also demonstrated an association in the seasonal occurrence of CPE. The out-break of CPE peaked in January (12.3 %) and February (14.2 %) (dry season) and May (9.7 %) and June (11.8 %) (wet season). A similar pattern of CPE occurrence has been reported in various part of Nigeria (Shima *et al.*, 2015; Francis *et al.*, 2019). The seasonal variation in CPE may not be entirely associated with climatic conditions (weather), but breeding periods of dogs. Breeding enhances the risk of spreading diseases among dogs as they congregate in large number from different places especially among stray and Nigerian local breeds of dogs. CPE is easily spread during courtship when males and females run together and male sniff the perinea area of females in an attempt to recognize heat (Sykes, 2014; Mylonakis *et al.*, 2016). Spread of this infection is enhanced at this time because CPV is highly contagious, and transmission occurs as a result of contact with infected faeces in the environment, through contaminated hair coat, fomites, insects and rodents (Greene and Decaro, 2012).

Breed distribution did not influence the occurrence of CPE in this study. Boerboel, Caucassian and Toy breed had the highest prevalence of CPE. Lower prevalence of CPE was encountered in German shepherd, Bull mastiff, Mongrel and Rottweiler. This result was comparable with that of Adejumobi *et al.* (2017) who found Rottweiler, German shepherd (Alsatian) and Boerboel to be more frequently affected by CPE. This present result was at variance with the findings of Shima *et al.* (2015) and Francis *et al.* (2019) who found significant

difference in breed distribution as influenced by CPE in their various areas of study. Breed susceptibility to CPE has remained unclear, with varied opinions as there is no molecular evidence supporting various hypotheses.

Conclusion: It can be concluded from this study that CPE is endemic in the study area with all year round occurrence especially among unvaccinated dogs. All breeds of dogs were susceptible to CPE and puppies were more vulnerable. The study therefore recommends aggressive vaccination of dogs. Clinicians and veterinarians should ensure the use of homologous vaccine containing the field strain for complete protection.

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