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Prevalence and detection of Canine parvovirus in domestic dogs in Nasirabad tehsil District Ajmer (Rajasthan)

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ABSTRACT

Objective. Since 1978 canine parvovirus (CPV) has been an important pathogen of domestic dogs, causing acute haemorrhagic enteritis and myocarditis mostly in puppies. This study was conducted to determine the prevalence of CPV strains in domestic dogs living around Nasirabad tehsil district Ajmer (Rajasthan) Materials and methods. Diarrheal stool samples were obtained from diseased dogs during the years 2016-17 and the presence of CPV was investigated. Results. The prevalence of canine parvovirus infection in the studied dogs was 8.33%. No significant differences between different age groups and breeds were found. However, infection was significantly higher in dogs with haemorrhagic diarrhoea, but it was not statistically significant using the chi-square test ($p>0.05$). Conclusions. This study showed that haemorrhagic diarrhoea and lack of vaccination may be considered important symptoms and risk factors for canine parvoviral infection in dogs.

Keywords - Diarrhoea; genomic detection; parvoviral infection; risk factor

INTRODUCTION

For centuries domestic dogs (**Canis familiaris**) have been used as human companion animals, hunters and for security purposes, they are one of the most abundant carnivore species (Daniel, 1989) and they are found almost everywhere in the world. Since they make up a large contiguous population with many individuals roaming freely (Begon, 2003) (Dye, 1995) this facilitates contact between infected and susceptible individuals, which makes them good reservoirs for pathogens (Cleaved, 2001) such as canine parvovirus, canine distemper (CDV) and rabies (Hess, 2002). Canine parvovirus, a small, non-enveloped and single-stranded DNA virus belonging to the family parvoviridae (Knipe, 2007; Reed, 1988; Parrish, 1999; Nakamura,2004) emerged in the mid-1970s from feline panleukopenia virus (FPV)(Truyen,1999) when it acquired a new host range in domestic canids. Since then, it has caused widespread mortality in domestic dogs (Hoelzer, 2010; Ikeda, 2002) which, following infection, suffer acute haemorrhagic enteritis and myocarditis (Burtonboy, 1979; Decaro,2005). The CPV type-2 (CPV-2) which was an original version of domestic dogs

evolved from feline panleukopenia (FPV) in the mid-1970s (Hoelzer, 2010; Ikeda, 2002) and further evolved into three antigenic variants, CPV-2a, CPV-2b and CPV-2c, which subsequently infected, and became endemic in several wild carnivores (Decaro,2012; Parrish, 1988, Steinel, 2001, Nandi, 2010).

The family Parvoviridae comprises two subfamilies, Parvovirinae and Densovirinae, infecting vertebrates and insects, respectively. Based on ICTV 10th report, eight genera are included in the subfamily Parvovirinae, namely Amdoparvovirus, Aveparvovirus, Bocaparvovirus, Copiparvovirus, Dependoparvovirus, Erythroparvovirus Protoparvovirus and Tetraparvovirus. Canine parvovirus (CPV) belongs to the genus Protoparvovirus. Canine parvovirus (CPV) was first identified in 1978 (Muzyczka,1998). It has a single-stranded DNA genome length of about 5.200 nucleotides. Parvoviruses are small (diameter of 25 nm), non-enveloped and their virion consists of a spherical capsid, which is composed of three proteins and contains a linear, single-strand DNA molecule (Sagazio,1998). The virus is a major pathogen in dogs and may cause myocarditis in young puppies. It causes haemorrhagic gastroenteritis in older animals. The enteric form of the disease has predominated and it persists as a major problem in breeding canines, or where vaccination is widely practised (Decaro,2005). Parvovirus infection is most manifested with signs like, vomiting, bloody diarrhoea and severe leukopenia (Shackelton,2005). The virus causes a highly contagious disease that can rapidly spread through a population of dogs. The virus is generally shed extensively for 7–12 days, but long-term excretion may occur as well (Cho Hs, 2004).

MATERIALS AND METHODS

Detection of CPV- A polyclonal antibody-based antigen-capture ELISA (AC-ELISA) has been used for the detection of Canine parvovirus (CPV) antigens in faecal samples of dogs. The assay uses rabbit anti-CPV polyclonal antibody as the capture antibody, guinea pig anti-CPV polyclonal antibody as tracing antibody and anti-guinea pig HRPO conjugate as the detection system. In the check-board titration, the optimum dilution of the capture antibody and the tracing antibody capable of detecting the CPV-2 antigens was found to be 1:1 600 and 1:400, respectively. The Canine Parvovirus (CPV) ELISA Test Kit by Secure Diagnostic were used to detect CPV.,

RESULTS

Infection and statistics. 120 faecal samples tested by ELISA Test kit. Of these, 10 samples (8.33%) were positive among which 3 (of 47) positive cases had haemorrhagic diarrhoea and 7 (of 73) positive cases had non-haemorrhagic diarrhoea (Table 1). The distribution of the

disease in two age groups of the tested dogs (less or more than 6 months) is mentioned in Table 2 and the distribution of positive cases in 4 different breeds (Gull terrier, Gull Dong, Indian Shepherd and mixed) is listed in Table 3. No significant differences between different age groups and breeds were found. However, infection was significantly higher in dogs with haemorrhagic diarrhoea (3 of 25), but it was not statistically significant ($p>0.05$) using the chi-square test.

Table 1. The prevalence of parvovirus in groups is categorized according to the type of symptoms.

Total	Positive (Percent)	Positive (Number)	symptom
47	6.38	3	Non-haemorrhagic diarrhoea
73	9.5	7	Haemorrhagic diarrhoea
120	8.33	10	**Total**

Table 2. The prevalence of parvovirus in different age groups.

Total	Positive (Percent)	Positive (Number)	Age group
47	8.51	4	Less than 6 months
73	8.21	6	More than 6 months
120	8.33	10	**Total**

Table 3. The prevalence of parvovirus in various breeds in this study.

Total	Positive (Percent)	Positive (Number)	Breed
19	5.26	1	Gull terrier
12	8.33	1	Gull Dong
17	0	0	Indian Shepherd
72	11.11	8	mixed
120	8.33	10	**Total**

DISCUSSION

Canine parvovirus (CPV) is the most important enteric virus responsible for severe enteritis infecting canids worldwide. It has been most frequently detected in both diarrheal and normal faeces. It has been approved CPV-2 specifically associate with diarrheal cases (Uwatoko,1995).

There are several methods used for the detection of this virus: electron microscopy (EM), virus isolation (VI), latex agglutination (LA), hemagglutination (HA), in situ hybridization (ISH), ELISA, and polymerase chain reaction (PCR) analysis (Decaro,2005).

The purpose of this study was to detect CPV in dogs. From 120 dogs suspected of being infected with CPV, historical data and clinical signs were collected. Faecal samples were screened for CPV.

In the present study, a low incidence rate was observed (8.33%). The above finding was not following those of Phukan et al who reported a 42.29% incidence of CPV infection among suspected dogs by sandwich ELISA method in Assam, India (Phukan, 2010). Srinivas et al also reported a 53.90% incidence by PCR assay using H primer in five states of southern India (Srinivas, 2013). However, higher incidences were reported by Phukan et al such as 64% positive by sandwich ELISA and 76% by indirect ELISA (Phukan, 2005). Singh et al. reported a higher incidence of 63%. Such high incidence might be due to the prevalence of endemic infection in the population under study (Singh, 2013) or the type of diagnostic test that each group used. Furthermore, the pattern of CPV-induced disease in a population is largely influenced by the susceptibility of the host, environmental conditions such as housing, hygiene, population density, and the pathogenicity of the infectious agent (Nandi, 2008).

In this study, breed-wise distribution of CPV revealed mixed breeds (11.11%) were more prone to CPV infection than other breeds. However, this higher CPV prevalence was not statistically significant ($p>0.05$) using the chi-square test (IBM SPSS 22). Similar findings were reported previously (Tajpara,2009) where 27.23% incidence was observed in the local breed. Archana et al (Archna,2009) also reported a higher prevalence of 56.9% in nondescript dogs. More incidences in mixed breeds might be due higher population of this breed making their proximity to spread the infection and poorness or absence of vaccination schedule being followed by the owners of mixed breeds presumably due to lack of awareness among them. No specific comments can be made on breed susceptibility as the population density of breeds varies from one geographical area to another (Archna, 2009).

Age-wise prevalence was found to be more between the age group of below 6 months. However, this higher CPV prevalence was not statistically significant ($p>0.05$) using the chi-square test. This higher prevalence rate below 6 months was also reported earlier (Parthiban, 2015; Xu J, 2011, Mahanraj,2010). The higher incidence of CPV below 6 months might be due to the affinity of the virus for rapidly multiplying intestinal crypt cells in weaning pups with higher mitotic index due to changes in bacterial flora as well as in the diet due to weaning (Deka, 2013, Stepita, 2013). The fall in maternal antibody level after 3 months of age might be one of the predisposing factors, which make the age group of 3-6 months old more prone to CPV and as they advance in age become prone to the infection in endemic areas due to decline in protective titers (Stepita, 2013). In contrast, Phukan et al. reported the highest incidence in the age group of 7-12 months followed by 1-6 months, 13 months and above (Ikeda,2000). The prevalence in the age more than 6 months might be due to improper age or timing of vaccination, non-bolstering of the animals and improper maintenance of the cold chain for storage of vaccines. We found that dogs with haemorrhagic diarrhoea are mostly infected with parvovirus. However, using the chi-square test, this higher CPV prevalence was not statistically significant ($p>0.05$). Since virus replication requires rapidly dividing cells of foetuses and newborns or of hematopoietic and intestinal tissues of young and adult animals its presence in haemorrhagic diarrhoea is predictable (Muzyczka, 2001).

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