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RESEARCH ARTICLE

PREVALENCE OF CANINE PARVOVIRUS INFECTION IN DOG IN RELATION TO CVASU, BANGLADESH AND VCRI-MVC, INDIA

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ABSTRACT

Background and Aim: Canine parvovirus (CPV) infection is the most highly infectious and contagious viral disease in dogs. Dogs of all age groups are susceptible but puppies of age less than 3 months are highly susceptible than adults. The current study was based on hospitalized patients, so a comprehensive study including all the dog population is required to precisely conclude about the prevalence and risk factors of CPV infections both in Bangladesh and India.

Design and Methods: The hospitalized dogs were considered as study population. In CVASU and VCRI-MVC about 50 and 110 dogs of different breeds (indigenous and exotic breed i.e. Spitz, Pug, Doberman, Rottweiler and GS) were clinically examined respectively during the study period. Total no of dogs were separated into different categories such as age, sex, breed and vaccination status.

Statistical analysis: All the data including categorical variables –age, sex, breed, vaccination status, dehydration, bloody diarrhoea and diagnosis were entered into MS excel (Microsoft Office Excel-2010). Then the data was finally analyzed using statistical software STATA Version-11 (STATA Corporation, College Station, Texas).

Results: Prevalence of CPV infection was higher in India than Bangladesh. Among different risk factors young, unvaccinated puppies, female dog, exotic breeds were more prone to CPV infection.

Conclusions: Canine Parvovirus is an infectious and highly contagious viral disease of dogs. Dogs of all age groups are infected but puppies age less than 3 months are highly susceptible than adults. CPV infection was mainly diagnosed by taking clinical history from owner and by observing the clinical findings. If confirmatory diagnosis was done then the result would be more precise.

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INTRODUCTION

Canine parvovirus (CPV) infection is an infectious and highly contagious viral illness that affects dogs. The name 'Parvovirus' originated from the Latin word "Parvus" which means small. It is a non-enveloped virus having a single stranded DNA genome belonging to the family of Parvoviridae.

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Dogs of all age groups are susceptible but puppies of age less than 3 months are highly susceptible than adults (Behera et al., 2015). This virus causes high morbidity (100%) and frequent mortality up to 10% in adult dogs and 91% in pups. Canine parvovirus (CPV) emerged in the late 1970s, probably from feline panleukopenia virus via genetic mutations and evolution. It has been stated that Doberman, Rottweiler and German shepherd (GS) dogs are more susceptible to Parvovirus infection than other breeds (Ling et al., 2012). Unvaccinated puppies aged between six weeks and six months are at greatest risk of developing CPV related disease (Godsall et al., 2010). Transmission of the infection can be occurred by direct or indirect ingestion or exposure to fecal materials from infected

dogs. The virus is shed through the feces of infected dogs within 4-5 days of exposure and also persists during the period of illness. After clinical recovery the patient can remain in infective stage for several months under good environmental condition (Uzuegbu, 2015). After exposure to virus, adult dogs may remain apparently healthy but act as a carrier for the transmission of the virus to the susceptible dogs. The virus manifest clinical signs in two different forms: 1.intestinal form 2.cardiac form. The most common form of the disease is enteritis. It is characterized by vomiting, diarrhea and dehydration, weight loss, anorexia, brownish or bloody and foul smelling diarrhoea and in severe cases fever (Pollock *et al.*, 1993). The course of illness is also highly variable depending on the infectious dose of the virus and clinical signs usually develop from 3 to 5 days following infection and typically persist for 5 to 7 days (Fletcher *et al.*, 1979). The less common form is the cardiac form which attacks the heart muscles of very young puppies, often leading to death. Within infected pups 70% usually dies in heart failure by 8 weeks of age and the remaining 30% gets pathological changes which may result in death many months or even years later. The most dramatic manifestation of CPV-2 myocarditis is the sudden death in young pups usually about 4 weeks of age (Mochizuki *et al.*, 1996).

The clinical manifestation of CPV infection depends on the age and immune status of the dogs, virulence of the virus, dose of the virus and pre-existing or concurrent parasitic, bacterial or viral infections (McAdaragh *et al.*, 1982). Factors that predispose to parvovirus infection in puppies are lack of protective immunity, intestinal parasites, overcrowded, unsanitary, and stressful environmental conditions (Hong *et al.*, 2007). Effective vaccination is required for the prevention of CPV infection. Both modified live (ML) and inactivated parvovirus vaccines have been used to protect susceptible pups. Puppies get protection during the first few weeks of their life through colostrum. The prevalence of CPV was reported as 77-80.4% in Thailand, 82.9% in Korea and 6% in Lithuania (Grigonis *et al.*, 2002). In India 1st outbreak of CPV infection was reported in Madras 1981 and in Bombay 1985 (Haque and Arfa, 2012). Though diarrhoea is one of the most common clinical features faced by the pet practitioners, in Bangladesh, there is a few published literature on CPV in dogs (Islam *et al.*, 2014). With the background mentioned above this study was undertaken to estimate the prevalence of CPV infection at CVASU in Bangladesh and at VCRI-MVC in India as well as the associated risk factors of CPV infection and finally to compare, CPV infection along with its associated risk factors between CVASU, Bangladesh and VCRI -MVC, India.

MATERIALS AND METHODS

Location and duration of study

The study was conducted at Chittagong veterinary and Animal Sciences University (CVASU) Bangladesh, at veterinary college and research institute (VCRI) and Madras veterinary college (MVC) hospital in India during the month of January 2017 to July 2017 respectively.

Study population

The hospitalized dogs were considered as study population. In CVASU and VCRI-MVC about 50 and 110 dogs of different breeds (indigenous and exotic breed i.e. Spitz, Pug, Doberman,

Rottweiler and GS were clinically examined respectively during the study period. Total no of dogs were separated into different categories such as age, sex, breed and vaccination status.

Case Definition

Diagnosis was made by anamnesis and clinical signs observed. In CPV infection the main clinical signs were high fever (104-105°F), vomiting, bloody diarrhoea. If a dog showed a signs of high fever, vomiting, blood with diarrhoea, anemia, dehydration, it was suspected as a CPV infection. Anemia was detected by pale mucous membrane. The degree of dehydration was estimated by skin fold test.

Clinical examination of Canine Parvovirus Infection

Data collection

Questionnaire was developed according to age, sex, breed, history of vaccination, clinical history and data were collected by interviewing owner. Rectal temperature, heart rate and respiration rate of the sample dog was measured. Skin fold test was performed to estimate the degree of dehydration. Then the clinical signs and symptoms were observed carefully. All the clinical signs and symptoms were separately recorded for each clinical case.

Clinical signs and symptoms

The disease was occurred in two forms

- Intestinal form (Enteritis)
- Cardiac form (Myocarditis)

The following clinical Signs were observed while treating the Patients

enteritis Form

Symptoms appeared within 3 to 5 days after exposure including depression, loss of appetite, high fever (above 104°F), vomiting, bloody diarrhoea were often seen, feces are generally light grey or yellow gray and may be streaked with blood, Severe anemia, If the animal was untreated, finally death occur within a few days due to hypovolumic shock and also associated with secondary bacterial sepsis.

Cardiac Form

It was usually seen in younger puppies less than 8 weeks of age. Dyspnea, crying and retching finally death occurs within 24 hours. Sometimes diarrhea and death occurs without showing cardiac signs cardiac failure, resulting sudden death.

Medication

There is no specific treatment for the disease. Antibiotic was administered to prevent secondary bacterial infection. Supportive treatment electrolytes were administered for rehydration to prevent hypovolumic shock, anti-emetics was administered to prevent vomiting (Table 1).

Table 1. Drugs were used in CVASU and VCRI-MVC in treatment of CPV Infection

Treatment	CVASU, Bangladesh	VCRI, MVC, India
1.Electrolytes	Normal saline (NS)	Ringer's lactate (RL)
2.Antibiotic	Cephalosporin	Amoxicillin and Cloxacillin
3.Anti-emetics	Emistst	Ondansetron
4.Other	Neotak	Pantoprazole

Statistical Analysis

All the data including categorical variables –age, sex, breed, vaccination status, dehydration, bloody diarrhea and diagnosis were entered into MS excel (Microsoft Office Excel-2010). Then the data was cleaned, coded, recoded and finally analyzed using statistical software STATA Version-11 (STATA Corporation, College Station, Texas). Prevalence was calculated according to different categories of the explanatory variables. To identify the association between a categorical explanatory variable with the outcomes (Occurrence of CPV infection), Chi-square (χ^2) test was performed. The association was regarded as significant if the P value was < 0.05 and highly significant when p value was 0.01.

RESULTS

In CVASU among the 50 clinically sick dogs, 21 were found positive for CPV infection. Prevalence of different risk factors (age, sex, breed, vaccination status, dehydration and diarrhea) associated with CPV disease is summarized in (Table-2). The study revealed that, the overall prevalence of CPV infection during the study period at CVASU in Bangladesh was 42%. The prevalence of CPV infection in different age group differed insignificantly ($P < 0.05$) and these were 52.94% for 1-3 months, 36.67% for 4-6 months and 33.33% for above 6 months of ages. Between two different sexes the prevalence was found higher in female (45.45%) than male (29.29%), however the relationship was not significant statistically.

Table 2. Prevalence of CPV Infection according to different risk factors at CVASU

Variables	Category level	No of observation (N=50)	Positive Case	Proportionate Prevalence %	P value
Age	1-3 month	17	9	52.94	0.073
	4-6Month	30	11	36.67	
	>6 month	3	1	33.33	
Sex	Male	28	11	29.29	0.661
	Female	22	10	45.45	
	Indigenous	18	10	55.55	
Breed	GS	11	5	45.45	0.202
	Rottweiler	9	3	33.33	
	Spitz	9	2	22.22	
	Doberman	3	1	33.33	
Vaccination	Yes	16	3	18.75	0.161
	No	34	18	52.94	

Table 3. Prevalence of CPV Infection according to different risk factors in VCRI-MVC

Variables	Category level	No of Observation (N=110)	Positive case	Proportionate Prevalence %	P value
Age	1-3 month	33	27	81.82	0.000
	4-6 month	55	21	38.18	
	>6 month	22	2	9.09	
Sex	Male	59	30	50.85	0.222
	Female	51	20	39.22	
	Indigenous	21	13	61.90	
Breed	GS	25	15	60.00	0.06
	Rottweiler	35	13	37.14	
	Spitz	24	7	29.17	
	Doberman	5	2	40.00	
Vaccination	Yes	42	6	14.29	0.000
	No	68	44	64.71	

Table 4. Comparison on prevalence of CPV Infection between CVASU, Bangladesh and VCRI-MVC, India

Variables	Category level	Proportionate prevalence % (CVASU, Bangladesh)	Proportionate prevalence % (VCRI MVC, India)	P value
Age	1-3 month	52.94	81.82	0.610
	4-6 month	36.67	38.18	0.242
	>6 month	33.33	9.09	0.023
Sex	Male	29.29	50.85	0.779
	Female	45.45	39.22	0.389
Breed	Indigenous	55.55	61.90	0.010
	GS	45.45	60.00	0.460
	Rottweiler	33.33	37.14	0.035
	Spitz	22.22	29.17	0.291
Vaccination	Doberman	33.33	40.00	0.348
	Vaccinated	8.8	14.29	0.226
	Non-vaccinated	60.0	64.71	0.227

Table 5. Different clinical signs observed among the CPV Infection in dogs

Variables	Category	No of Observation (N)	Positive case	%
Bloody	Yes	70	64	91.42
	No	90	7	7.78
Diarrhea	Yes	74	70	94.59
	No	86	1	1.16
Dehydration	Severe	70	59	84.28
	Moderate	40	8	20
	Mild	50	4	8

Among the breeds the rate of infections were encountered as 33.33% in Doberman, 22.22% in Spitz, 33.33% in Rottweiler, 45.45% in GS, 55.55% in Indigenous in which were differed insignificantly ($P>0.05$). While considering vaccination status against CPV there observed a substantial difference ($P<0.01$) in occurrence of CPV infection which were 18.75% in vaccinated dogs and 52.94% in non-vaccinated dogs. At VCRI-MVC, in India-110 dogs were studied, of which 50 were found positive. The risk factors (age, sex, breed and vaccination status) that might have influenced the prevalence of CPV infection are summarized in (Table-3). The estimated prevalence of CPV disease at VCRI-MVC in India was 45.45%. Prevalence was significantly differed ($P<0.05$) according to age groups, it was 81.82% for 1-3 months, 38.18% for 4-6 months, and 9.09% for above 6 months. Between male and female, prevalence was not statistically significant ($P<0.05$) where 50.85% male, and 39.22% females were affected. Among the breeds of dog, prevalence was significantly varied; ($P<0.05$) 60.00% for GS, 61.90% for Indigenous, 37.14% for Rottweiler, 29.17% for Spitz and 40% for Doberman. Moreover vaccinate 14.29% and Non-vaccinated 64.71% dogs were significantly ($P<0.05$) affected with CPV infection. Table 4 represents the data of comparative study of CPV associated risk factors. It was revealed that the prevalence of different risk factors associated with CPV infections was insignificant ($P>0.05$) between CVASU and VCRI-MVC. Study revealed that in 91.42% blood with diarrhoea, 94.59% vomition and 84.28% Severe, 20.0% moderate, 8.0% mild dehydration were recorded in CPV infection (positive) in dogs.

DISCUSSION

We estimated an overall prevalence of CPV infection in suspected dogs in CVASU as 42%. The result is in agreement with a previous reports from Bangladesh where prevalence of CPV in street dogs, at Mymensingh metropolitan city was estimated as 30.0% (Islam *et al.*, 2014). Overall prevalence of CPV infection in suspected dogs in VCRI-MVC, India was 45.45%. Similar findings were reported previously where prevalence was 40.8% (Behera *et al.*, 2015). Prevalence of CPV infection is higher in India than Bangladesh. This might be due to presence of endemic infection in the population under study at VCRI-MVC in India. Prevalence of CPV infection was higher among 1-3 months of age group than other age groups (Table-2,3) which support the study conducted by Vivek (2011).

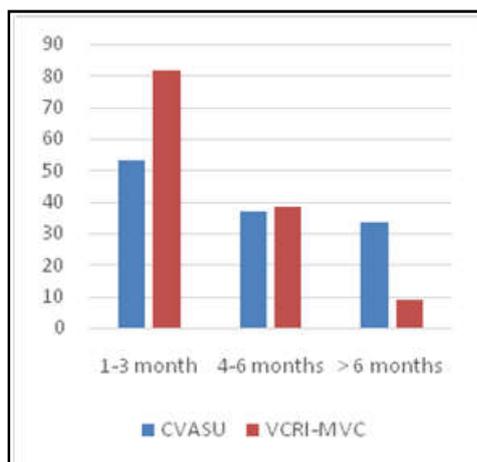


Figure 1. Age wise prevalence of CPV in CVASU, VCRI-MVC

Younger puppies (≤ 3 months) were mostly affected which might be due to the affinity of the virus being multiply rapidly at intestinal crypt cells at the weaning age along with higher mitotic index. Prevalence of CPV infection below 3 months of age was insignificantly higher in VCRI, MVC than CVASU (Figure 1). In CVASU, prevalence of CPV infection was slightly higher in female (45.45%) compared with male (29.29%). The study was in agreement with Islam *et al.*, (2014). Oppositely male dogs were more susceptible (50.85%) than the female (39.22%) at VCRI-MVC (Table-3), supported with Umar *et al.*, (2015). The susceptibility of male was higher in CPV infection (India) however in Bangladesh female was more susceptible (Figure 2).

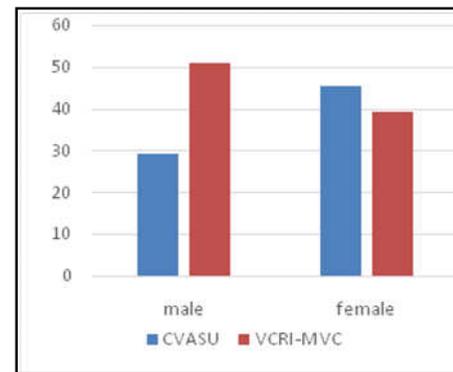


Figure 2. Sex wise prevalence of CPV in CVASU, VCRI-MVC

It might be due to most of the Indian people kept female for breeding purpose than Bangladeshi people. Breed wise distribution shown that prevalence of CPV disease was more in local indigenous breeds than exotic breeds at CVASU. Among the exotic breeds Spitz, GS, Doberman were more susceptible (Table 2). Among the breeds in VCRI-MVC, The occurrence of CPV infection is significantly higher in local indigenous than the exotic breeds (Table-4) which supported by published papers (Shukla *et al.*, 2009). This study also exposed that among the exotic breeds, GS, Doberman were higher in susceptibility than the other breeds due to inherited immunodeficiency. It was supported by previous reports (Singh *et al.*, 2013) where CPV infection was highest in Indigenous (55.55%), followed by German shepherd (45.45%). In CVASU, Spitz was more susceptible (Figure 3) might be due to its small size & most preferable breed in Bangladeshi people.

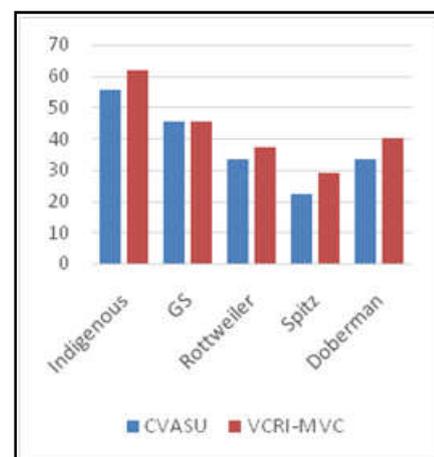


Figure 3. Breed wise prevalence of CPV in CVASU, VCRI-MVC

In MVC-VCRI local indigenous dogs were higher susceptible due to higher population density of this breed, poor vaccination and lack of awareness. Among exotic breeds GS, Doberman were highly susceptible. In non-vaccinated dogs the prevalence was higher compared to vaccinated ones (Figure 4).

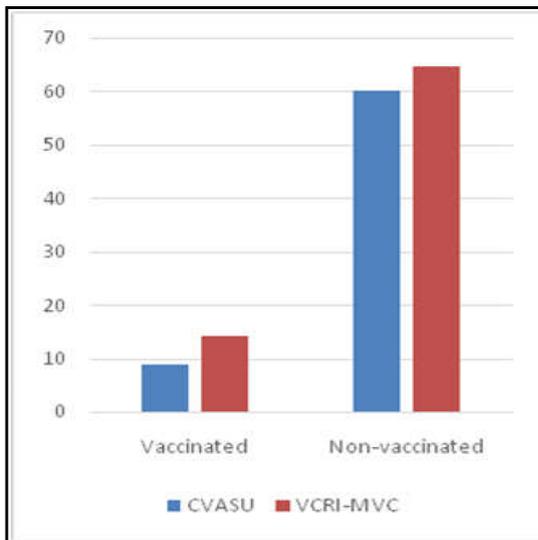


Figure 4. Prevalence of CPV in CVASU, VCRI-MVC according to vaccination

The finding is in agreement with published report (Godsall *et al.*, 2010) where unvaccinated puppies aged between six weeks and six months were at greatest risk of developing CPV infection. The higher prevalence of CPV infection in non-vaccinated dogs might be due to lack of protective immunity. In vaccinated dogs there was presence of CPV infection might be occurred due to, incomplete or ineffective primary vaccination course, or failure of vaccination. The study was performed on the basis of tentative diagnosis by observing clinical signs and symptoms. The main clinical signs of CPV disease are bloody diarrhoea, vomition and dehydration. The study findings were in agreement with Thomson and Gagnon, (1978); Prittie (2004). In 91.42% and 94.59% CPV positive dogs, there were presence of blood with diarrhoea and vomition (Table-5). Similar finding was also reported previously by Thomson and Gagnon,(1978). 84.28% CPV positive dogs had severe dehydration (Table-5) which is supported by previous study (Laforcade *et al.*, 2003).

Conclusion

Canine Parvovirus is an infectious and highly contagious viral disease of dogs. Dogs of all age groups are infected but puppies age less than 3 months are highly susceptible than adults. Both male and female are affected with CPV infection. Both indigenous and exotic breeds (German shepherd, Doberman, Spitz, Rottweiler), are susceptible in CPV infection. The rate of infection is high in non-vaccinated than vaccinated dogs. Due to the short duration of the study period the sample size of current study was not sufficient. CPV infection was mainly diagnosed by taking clinical history from owner and by observing the clinical findings. If confirmatory diagnosis was done then the result would be more precise. The current study was based on hospitalized patients, so a comprehensive study of all the dog population is required to identify the actual prevalence and risk factors of CPV infections both in Bangladesh and India.

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Conflict of interest: None to declare.

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