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DETECTION OF CANINE PARVOVIRUS ANTIGEN IN DOGS IN KUMASI, GHANA

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Abstract

Background: Canine Parvovirus (CPV) in dogs has been documented in many countries. However, evidence of the infection is scanty in Ghana. This study was conducted to detect canine parvovirus antigen in dogs presented with diarrhoea to the Government Veterinary Clinic in Kumasi, Ghana.
Materials and Methods: Faecal samples from 72 dogs presented with diarrhoea were tested for the presence of canine parvovirus antigen using commercially available rapid test kit (BIT® Rapid Colour Canine Parvovirus Ag Test Kit, BIOINDIST Co. Ltd, Korea) based on the principle of immunochromatography. Influence of breed, sex, age, vaccination history and the nature of diarrhoea were assessed. Data obtained was analysed with SPSS and subjected to the chi-square test. Significance was at $\alpha_{0.05}$
Results: We found 61.11% tested positive (44/72) for CPV. Based on sex, 61.54% of males (20/33) and 60.61% of females tested positive (24/39). A total of 65.67% of samples from puppies below 6 months were positive. 56.25% of CPV vaccinated dogs and 70.83% of unvaccinated dogs were positive respectively. 69.05% of samples from haemorrhagic diarrhoeic dogs and 50.00% from non-haemorrhagic diarrhoeic dogs were positive of CPV.
Conclusion: The study is the first documented evidence of the existence of CPV in Ghana. It also revealed that absence of bloody diarrhoea does not necessarily rule out CPV infection.

Key words: Canine Parvovirus, Diarrhoeic dogs, Kumasi, Ghana

Introduction

Dogs are the most popular animals kept as pets in the world with an estimated population of 525 million as at 2012 (Coren, 2012; Gompper, 2013). In Ghana, there is an increasing interest in keeping of dogs for various reasons hence it is necessary to have a knowledge of diseases and common conditions of dogs in the country.
Diarrhoea in dogs is a common occurrence with a myriad of causes (Hubbard *et al*., 2007) which if not promptly and properly treated could have fatal outcome. Canine Parvovirus (CPV) is considered by many researchers as the leading cause of diarrhoea in dogs under 6 months old (Hackett and Lappin, 2003; Prittie, 2004, Yesilbag *et al*., 2007, Schulz *et al*., 2008). Other clinical signs associated with CPV include acute vomiting, anorexia, haemorrhagic diarrhoea, dehydration and depression (Mitchell, 2015). However, not all dogs with CPV enteritis present with bloody diarrhoea or leukopenia. Furthermore, other diseases such as enteropathogenic bacterial infection, parasitic infection, coronavirus or rotavirus infections are possible differentials to CPV (Nahat *et al*., 2015). For the diagnosis of CPV, use of Polymerase chain reaction (PCR) is highly recommended to be used on faecal samples with accompanying histopathology and immunohistochemistry on necropsy specimens, however, in a poor resource setting, a rapid CPV Antigen test kit may be employed especially in dogs with diarrhoea.

Literature on the existence of CPV infection abounds in many countries including African countries such as Tunisia (Touihri *et al*., 2009), South Africa and Nigeria (Bajehson, 2010), where antigenic presence of CPV have been documented, however, there is dearth of such information in Ghana where in many veterinary clinics, CPV is mostly tentatively diagnosed based on clinical signs such as vomiting, profuse foul-smelling bloody diarrhoea and dehydration. The Government Veterinary Clinic in Kumasi, Ghana is one of such clinics where there have been several cases of

morbidity and mortality in dogs due to suspected CPV in both CPV-vaccinated and unvaccinated dogs with no diagnostic tests performed to confirm the disease. This study was thereby done to provide documented evidence of the existence of CPV in dogs in Kumasi, Ghana.

Materials and Methods

Study Area

The study was conducted at Regional Veterinary Clinic in Kumasi, Ghana (Latitiude 6.69º and Longitude 1.61º). Kumasi is the second largest city in Ghana and the capital of the Ashanti Region. Most of the dogs presented for treatment at this clinic live within the Kumasi Metropolis.

Study Design and selection criteria of dogs sampled

A clinic based study was carried out for the antigenic detection of CPV in 72 dogs presented to the Government Veterinary Clinic, Kumasi with history and/or clinical signs of diarrhoea and anorexia with or without vomiting. Faecal samples of those dogs were taken from the rectum using sterile swabs and tested with a commercially available rapid CPV Ag test kit (manufactured by BIOINDIST Co. Ltd, Korea) based on immunochromatography (IC) assay technique. The test was conducted according to the protocol provided by the manufacturer.
All applicable international, national and institutional guidelines for the care and use of animals were followed with adequate measures taken to minimize pain or discomfort.

Data Collection and Analysis

For each dog tested, data was collected regarding age, sex, breed, nature of diarrhoea (haemorrhagic or non-haemorrhagic) and CPV vaccination history and recorded accordingly. The data was analysed using SPSS version 23 and was subjected to Chi-square test at confidence level of 95%.

Results

A total of 72 dogs presented with diarrhoea were tested for the presence of CPV antigen. Out of this number, 61.11% tested positive (44/72).
Different breeds of dogs were tested. Rottweilers recorded the highest percentage of positive cases of 87.50% (7/8), followed by the Boerboels and Mixed Breeds with positive cases of 69.23% (9/13) and 54.55% (18/33) respectively. The lowest percentage of positive cases was recorded in the Bull mastiff with 41.67% (5/12) as shown in Figure 2. CPV was also detected in Shi Tzu, German Shepherd, Bordeaux and English Mastiff. No local breed was presented to the clinic with symptoms described for CPV during the study period.

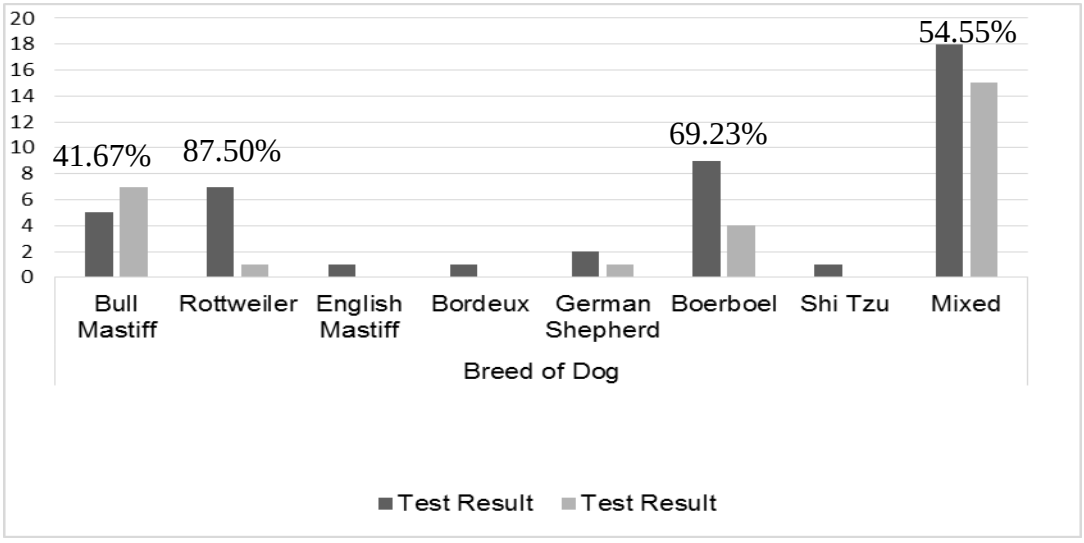

Figure 1: Distribution of the total number of dogs tested according to breed representation.

Table 1: Prevalence of CPV by sex, age, vaccination status and nature of diarrhoea (with or without blood) of sampled dogs

		Positive	Negative	TOTAL	
Sex	Male	24(61.54%)	15(38.46%)	39 (54.17%)	p-value 0.935
	Female	20(60.61%)	13(39.39%)	33 (45.83%)	$\mathbf{X^2}_{cal} = 0.007 < \mathbf{X^2}_{0.05} = 3.841$
	TOTAL	**44(61.11%)**	**28(38.89%)**	**72(100.00%)**	
Age	0-6 months	44(65.67%)	23 (34.33%)	67 (93.06%)	p-value = 0.004
	>6 months	0 (0.00%)	5(100.00%)	5 (6.94%)	$\mathbf{X^2}_{cal} = 8.443 > \mathbf{X^2}_{0.05} = 3.841$
	TOTAL	**44(61.11%)**	**28 (38.89%)**	**72 (100.00%)**	
Vaccination status	Vaccinated	27(56.25%)	21(43.75%)	48 (66.67%)	p-value = 0.231
	Not vaccinated	17(70.83%)	7(29.17%)	24 (33.33%)	$\mathbf{X^2}_{cal} = 1.432 < \mathbf{X^2}_{0.05} = 3.841$
	TOTAL	**44(61.11%)**	**28(38.89%)**	**72(100.00%)**	
Nature of diarrhoea	With blood	29(69.05)	13(30.95)	42 (58.33)	p-value = 0.102
	Without blood	15(50.00)	15(50.00)	30 (41.67)	$\mathbf{X^2}_{cal} = 2.672 < \mathbf{X^2}_{0.05} = 3.841$
	TOTAL	**44(61.11)**	**28(38.89)**	**72(100.00)**	

Regarding sex predisposition, males recorded a higher percentage of positive cases (61.54%; 24/39) than females (60.61%; 20/33). The dogs tested were divided into two age groups: <6 months old and >6months old. Puppies below 6 months recorded a percentage of 65.67% (44/67) positive cases whereas no positives were recorded in dogs older than 6 months (0/5). Out of 24 unvaccinated dogs that were presented, 17 were positive (70.83%), while 27 out of 48 vaccinated dogs presented were also positive (56.25%) for CPV antigen. CPV antigen was detected in both categories of dogs with and without haemorrhagic diarrhoea. 15 out of 30 dogs presented without haemorrhagic diarrhoea tested positive representing 50% and 29 out of 42 (60.05%) presented with haemorrhagic diarrhoea also tested positive.

Discussion

This study appears to be the first report documenting the detection of CPV antigen in the faeces of dogs in Ghana. In this study, out of 72 dogs tested, 44 were positive representing a prevalence of 61.11%. From this study, Rottweiler breed was found to be most susceptible breed to CPV infection in comparison to other breeds presented during the study period. This agrees with earlier reports where Rottweiler and Doberman Pinscher breeds were indicated to be more susceptible to the development of CPV disease (Glickman *et al*., 1985; Houston *et al*., 1996). However, some workers have reported higher prevalence in German Shepherd breed (Kumar *et al*., 2011; Singh *et al*., 2013; Shima *et al*., 2015). In this study, however, the German Shepherd, Shi Tzu, English mastiff and Bordeaux were not included in breed-wise analysis because a few of these breeds were presented during the study period..

In this study, no local breed of dog or mongrel was presented with symptoms of CPV during the study period. This further strengthens the notion of most clinicians in Ghana that the local breeds of dogs and hybrids of exotic and local breeds (mongrels) are less susceptible to CPV infection. Though the status of CPV in local dogs in West Africa is relatively scanty in literature, studies from Nigeria recorded 1 out of 17 (5.56%) of the local breeds positive for CPV as compared to 11 out of 41 (21.15%) of the exotic breeds (Ogbu *et al*., 2016) while Shima *et al*. (2015) in a retrospective study from 2000 to 2013 reported the highest cases of CPV in local breeds of dogs and mongrels. These reports necessitate an in-depth study of the role of local breeds of dogs in the epidemiology of CPV in West Africa.

Regarding sex, the study showed that it has no influence on the occurrence of CPV infection in dogs. This agrees with similar findings by Singh *et al*., (2013), Gombac *et al.*, (2008) and Ogbu *et.al*., (2016). However, it is in contrast to Houston *et al*., (1996) who found males to be more susceptible and Umar *et al*., (2015) reported females to be more susceptible.

With regards to age, results from this study agree with work done in India (Biswas *et al*., 2006; Singh *et al*., 2013), Slovenia (Gombac *et al*., 2008) and Nigeria (Ogbu *et al*., 2016), which showed a higher prevalence in dogs less than 6 months old at a higher risk of infection. The high prevalence of CPV infection in dogs less than 6 months old could be due

to interference of maternal antibodies, improper vaccination protocol, lack of maternal immunity and poor efficiency of the immune system of puppies (Klingborg *et al*., 2002, Umar *et al*., 2015).

Concerning vaccination history, the results indicated a higher percentage of positive cases in unvaccinated dogs than in vaccinated dogs. This corresponds with the findings of Singh *et al*., (2013) who had a prevalence of 64% in unvaccinated dogs and 50% vaccinated dogs. There was no dependence of the vaccination status of the dogs on the susceptibility to CPV infection in this study. This was similar to work done by Miranda *et al*. (2015) who found vaccination status not to be a risk factor for CPV infection but was in variance with recent work done by Ogbu *et al*. (2016), implying a dependence of vaccination status on the susceptibility to CPV infection validating the claim that vaccinated dogs are protected against CPV. The high percentage of positive cases in vaccinated dogs in this study could be as a result of irregular vaccination or the use of improperly maintained vaccines (Singh *et al*., 2013). The prevailing energy crises (unstable electricity) in Ghana could account for improper storage of the vaccines (break in the cold chain), rendering them inefficacious. Decaro *et al*. (2007) in their study found out that most clinical cases of CPV occurring shortly after vaccination are not as a result of reversion to virulence of the MLVs in the vaccines but are rather related to infection with field strains. Worthy of note therefore is the possible strain difference in the vaccine virus and those circulating on the field, this possible difference calls for characterization of CPV field isolates in Ghana. Also previously infected pens without proper disinfection could therefore serve as source of infection to puppies even before vaccination begins.

This study detected the presence of CPV in dogs presented with haemorrhagic diarrhoea as well as in dogs without haemorrhagic diarrhoea. Furthermore, not all dogs presented with haemorrhagic diarrhoea tested positive to CPV. However, dogs presented with haemorrhagic diarrhoea had a higher prevalence of 69.05% as compared to 50.0% dogs without haemorrhagic diarrhoea. Mosallanejad *et al*. (2008) reported similar findings. This particular finding is very important to note, particularly in Ghana where most clinicians rely on the presence of profuse foul-smelling watery bloody diarrhoea as the main clinical sign to tentatively diagnose CPV. This study showed that absence of bloody diarrhoea may not be often presumed to be CPV negative.

In conclusion, although the sample size is small, the study was able to show that Canine Parvovirus infection exists in Ghana with a detection rate of 61.11%. It also revealed that breed and age of dogs had influence on the susceptibility to CPV with Rottweilers and Boerboels being the most susceptible breeds and puppies below 6 months being most susceptible age group. Vaccinated dogs could still be susceptible to CPV infection. CPV is detected in dogs presented with bloody diarrhoea as well as in dogs without bloody diarrhoea, hence absence of foul-smelling bloody diarrhoea should not be the indicator to rule out CPV in dogs.

It is recommended that further studies be conducted with large sample size and coverage to investigate the cause of high detection rate of CPV in vaccinated dogs, the pathology in vaccinated and unvaccinated dogs. The study on the strain difference in the vaccine virus and those circulating on the field should be encouraged with a focus of characterization of CPV field isolates in Ghana.

Conflict of Interest: The authors declare no conflict of interest.

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