

IMPACT OF HAEMORRHAGIC GASTROENTERITIS ON CANINE TOTAL LEUCOCYTE COUNT AND DIFFERENTIAL LEUCOCYTE COUNT

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ABSTRACT

Haemorrhagic gastroenteritis (HGE) is caused by viruses, bacteria, endo-parasites and even by food allergy as well as irritant drugs. Clinical signs include fever, vomiting and severe bloody and foetid diarrhoea with marked dehydration. Present study was conducted to evaluate alterations in total leucocyte count (TLC) and differential leucocyte count (DC) in twenty six dogs, out of which thirteen dogs were naturally infected with haemorrhagic gastroenteritis and the rest were treated as control. The haematological parameters were screened by standardized procedure to stratify the difference between two groups. The analysis of diseased dogs revealed low values of total leucocyte count. Neutropenia with lymphocytosis were also observed in parvo infected canines. However, no significant difference was noticed in mean values of monocyte, eosinophil. There may be very few basophils, which was not noticed in this present study in healthy and gastroenteritis infected dogs.

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INTRODUCTION

In the field of veterinary pediatrics especially in canine, various diseases cause morbidity and mortality in dogs; among them canine parvovirus enteritis is highly contagious and often fatal disease. It has worldwide distribution and is widely prevalent in India. Parvovirus is shed in the faeces, so the faecal-oral route of the transmission is most common (Sagar *et al.*, 2008). Causative agents are viruses like Parvo virus, Corona virus and Rota virus; bacteria like *Salmonella* spp., *Escherichia coli*, *Clostridium* spp.; endoparasites such as *Dipylidium caninum*, *Ancylostomacanthum*; food allergy and irritant drugs (Sharma *et al.*, 2008). CPV belongs to family Parvoviridae, subfamily Parvovirinae and genus Parvovirus. During last three decades, canine parvovirus infection (CPV) has emerged as a major cause of gastroenteritis in dogs in many parts of the world. It is a highly infectious viral disease of dogs (Amaravathi *et al.*, 2016).

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The original viral strain, designated as canine parvovirus 2 (CPV-2), is distinguished as the novel virus from the previously known CPV-1 or minute virus of canines, (MVC), that caused hemorrhagic gastroenteritis (HGE), pneumonia and subacute myocarditis in kennels and shelters worldwide (Behera *et al.*, 2014). Canine parvo viral infection is usually associated with puppies under 6 months old. Certain breeds like German shepherd, Labrador and Spitz are reported to be at higher risk of parvoviral enteritis, whereas Mongrel is less susceptible (Sagar *et al.*, 2008). Various factors like bacterial and viral infections, parasitic infestations, irritant drugs, dietary errors, ingestion of toxic materials etc. have been reported to be associated with canine enteritis (Ettinger *et al.*, 2010). Clinical signs include fever, vomiting and severe bloody and foetid diarrhoea with marked dehydration leading to marked leukopenia and immune-suppression. Weight loss or stunting is seen in dogs that are more severely affected (Hall *et al.*, 2011). Factors that predispose to parvoviral infection in puppies are lack of protective immunity, intestinal parasites, overcrowding, unsanitary and stressful environmental conditions (Parthiban *et al.*, 2016). These variations were

thought to be due to the effect of climate, nutrition and sub clinical state of animals (Dash *et al.*, 2013). However, observation of clinical signs and evaluation of haematological parameters help to determine the general level of health in animals, distinguishing them from diseased ones (Coles, 1986). The clinical form of parvo virus infection may not manifest all the signs and sometimes may mimic other diseases, thus causing difficulty in the diagnosis of infection and clinical management of affected dogs. Therefore, the present study was planned to determine the disease through the alterations in TLC and DLC between gastroenteritis infected dogs and healthy dogs.

MATERIALS AND METHODS

Dogs exhibiting signs of vomiting and foul smelling bloody diarrhoea were selected for the study from the Teaching Veterinary Clinical Complex (TVCC), College of Veterinary Science and Animal Husbandry, OUAT, Odisha. Males and females of Labrador, Spitz, German Shepherd dogs and descript breeds aging between 5 months to 12 years were included. A total of twenty-six dogs were screened for haematological study. Out of which thirteen canines were naturally infected with parvoviral gastroenteritis and thirteen healthy dogs were selected randomly as control. Two milliliters of blood samples were collected in EDTA vacutainers from saphenous vein of dogs. Haematological parameters of canine gastroenteritis and healthy dogs were studied using standard methods such as TLC by Haemocytometer and DC using Leishman’s stain. Data obtained during the course of analysis were statistically analysed to assess significant heterogeneity between healthy and gastroenteritic dogs by using Independent Samples T-Test at 5% level. All data were expressed as mean ± standard error of means. Differences were considered significant when the P values were less than 0.05. The analysis was performed by using data analysis of Microsoft windows excel package.

$$\text{Standard Error} = \frac{\sqrt{\text{Variance}}}{\sqrt{n}}$$

RESULTS

Total leucocyte count: Canines suffering from gastroenteritis infection had lower leucocyte (8.65×10^3 per cubic mm) count than healthy canines (17.61×10^3 per cubic mm). The highest value was recorded as 10.2×10^3 per cubic mm and lowest to be 5×10^3 per cubic mm in gastroenteritis canines. On the other hand healthy dogs indicated TLC ranging from 9.88 to 24.5×10^3 (per cubic mm) of blood (Fig. 1a).

Differential leucocyte count: In HGE affected dogs neutropenia is observed as compared to healthy dogs. The study revealed that the neutrophil % ranged from 70 to 92 in healthy control dogs with mean value of $81.38 \pm 1.69\%$, which is higher than gastroenteritis dogs (Fig.1b). The lymphocyte % was higher in HGE, which ranged from 8 to 26 per cent with a mean value of 16.77 ± 1.64 percent (Fig.1c). The mean eosinophil count in healthy dogs was found to be 1.23 ± 0.36 percent and monocyte count was very much low with an average of 0.62 ± 0.27 percent (Table 1). There was very little variation noticed in eosinophil and monocyte count between healthy and HGE canines. The comparison of differential

leucocyte counts between healthy and gastroenteritis canines have been shown in Fig.1d.

DISCUSSION

In gastroenteritis severe vomiting and bloody diarrhoea leads to dehydration, alteration in body electrolyte balance and haematological parameters. According to Shah *et al.*, (2013) the clinical signs initially are nonspecific like anorexia, lethargy, depression and fever, later manifested with typical signs of vomiting and diarrhoea that leads to alterations of haematological parameters.

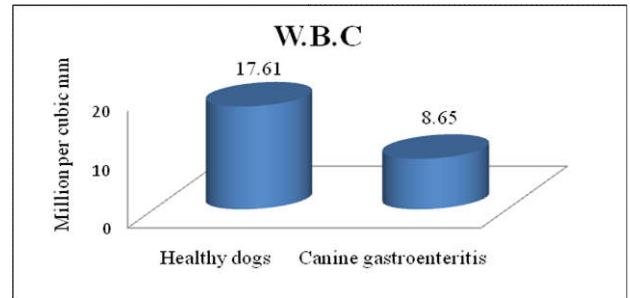


Figure 1a. Total leucocyte count of healthy and gastroenteritis canines

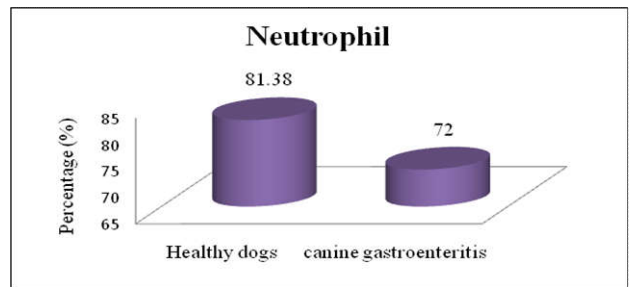


Figure1b. Neutrophil percentage of healthy and gastroenteritis canines

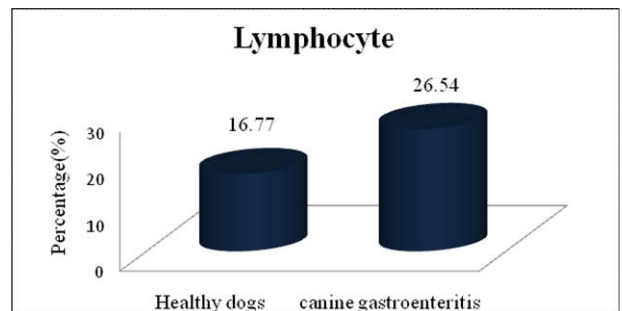


Figure 1c. Lymphocyte percentage of healthy and gastroenteritis canines

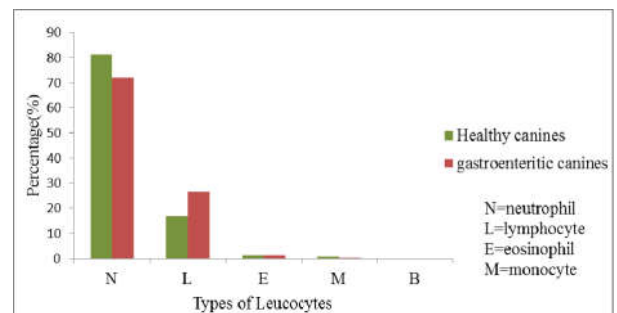


Figure 1d. Comparison of differential leucocyte count between healthy and gastroenteritis canines

Table 1. Haematological values of healthy and gastroenteritis infected canines (n=26)

Parameters	Healthy canines		Gastroenteritis canines	
	Mean±SE	Observation range	Mean±SE	Observation range
TLC($\times 10^3 \mu\text{l}$)	17.61±0.96	9.88-24.5	9.76±2.78*	5-43
Neutrophil(%)	81.38±1.69	70-92	72±2.26**	64-90
Lymphocyte(%)	16.77±1.64	8-26	26.54±2.47**	10-34
Eosinophil(%)	1.23±0.36	0-4	1.15±0.42	0-4
Monocyte(%)	0.62±0.27	0-2	0.31±0.21	0-2

* Significant at 5% level ($p < 0.05$)** Significant at 1% level ($p < 0.01$)

Hence, the present study was aimed to evaluate the alteration between the total leucocyte count and differential leucocyte count in healthy and gastroenteritis canines. The mean TLC value in the present study indicated that there was severe leucopenia in case gastroenteritis dogs as compared to healthy control groups, which agreed with the study conducted by Behera *et al.*, (2014), Sagar *et al.*, (2008) and Haligur *et al.*, (2009). This finding is widely accepted and attributed not only to the destruction of hematopoietic progenitor cells of various leukocyte types primarily in the bone marrow, but also in other lympho-proliferative organs such as the thymus, lymph nodes, and spleen. This is resulted in inadequate compensation for the massive demand for leukocytes (specifically neutrophils) in the inflamed gastrointestinal tract (Goddard *et al.*, 2008). The high mortality in dogs with severe leukopenia can largely be attributed to their high susceptibility to secondary bacterial infections that can lead to septicemia. Neutropenia was observed in most of the infected dogs. Thus, neutrophils are the most important leukocytes to monitor during the course of the disease according to Roble *et al.* (2016). The mean neutrophil and lymphocyte percentage of healthy and gastroenteritis dogs also differed significantly (at $p < 0.01$). The demand for neutrophils is high in the inflamed gastrointestinal tract, but due to hematopoietic cell destruction of leukocytes in lympho-proliferative organs like the bone marrow, there is an inadequate supply of leukocytes leading to several other hematological changes (Goddard *et al.*, 2008). The marked eosinopenia in CPV infection has been reported by Goddard *et al.*, 2008 and they suggested that it could be caused by a combination of myelo-suppression, lack of T lymphocyte stimulation for eosinophil production by the bone marrow and the endogenous release of high concentrations of cortisol. The present study revealed lymphocytosis in infected dogs, which again contradicted the findings by Sagar *et al.*, (2008). However, in the present study there was no significant change in the monocytes and eosinophil percentage between healthy and canine gastroenteritis groups. However, no basophils were found in this present study in healthy and CPV infected dogs. This suggested that there might be no effect on these parameters due to parvoviral infection (Sulthana, 2015).

Conclusion

In dogs canine parvoviral infection was manifested by high risk of body temperature, vomiting, loss of appetite, severe diarrhoea with frank haemorrhage and dehydration. Most of the studies have suggested alterations in haematological parameters making the dogs more susceptible to gastroenteritis infection. Blood analysis showed leucopenia and neutropenia in infected dogs. However, no significant difference at ($p < 0.05$) of eosinophil and monocyte values were observed in healthy and gastroenteritis dogs. There is no doubt that the findings of the present study would encourage the people to pay attention towards the general health of their pets.

Since the disease is also caused due to nutritional mismanagement, proper dietary supplementation should be provided to reduce the chance of the gastroenteritis infection.

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