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Clinical and haemato-biochemical changes in canine parvovirus infection

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Abstract
Thirty two cases of canine parvovirus were diagnosed during the study by Scan vet Parvo[tm] kit. The most common clinical signs observed in current investigation were anorexia, vomition diarrhoea and pale mucus membrane. Data of hematology and serum biochemistry was compared with the reference data. The frequent hematological abnormalities observed were anaemia and marked leucopenia. The levels of total protein were declined while level of liver enzymes i.e. Alanine aminotransferase and Aspartate aminotransferase were elevated.

Keywords: Anaemia, haematology, serum biochemistry and canine parvovirus

Introduction
Canine parvovirus enteritis is a highly contagious and fatal disease caused by parvovirus type - 2 affecting mainly intestinal tract and causing vomition, diarrhoea and fever [12]. Acute enteritis is the most common manifestation of the disease and Doberman, Rottweiler and German shepherd (GSD) dogs seem to be more susceptible to Parvovirus infection than other breeds [14]. Initial clinical signs are non specific, and include anorexia, depression, lethargy and fever. On later stages the typical signs include vomiting and small bowel diarrhea that can range from mucoid to hemorrhagic. Acute parvoviral enteritis can be seen in dogs of any breed, age or sex but puppies between 6 weeks and 6 months of age appear to be more susceptible [8]. Factors that predispose to parvoviral infection in puppies are lack of protective immunity, intestinal parasites and overcrowded, unsanitary and stressful environmental conditions. Outbreaks of CPV have been reported from many countries including India. The prevalence study in India was first reported by Balu and Thangaraj [1] in Madras. The leukocyte count during CPV enteritis is generally characterized as significantly depressed, with a transient lymphopenia being the most consistent finding [5].
The present study was an attempt to study the hematobiochemical alterations in canine parvovirus infection.

Materials and Methods
The study was conducted on 980 dogs suffering from vomiting and diarrhoea from August 2017 to January 2018 at college of veterinary science and animal husbandry Jabalpur, The dogs suffering were screened by Scan vet Parvo[tm] kit (Immunochromatographic assay based kit) for the diagnosis canine parvovirus infection. Five ml of blood was collected aseptically from recurrent tarsal vein of which 2 ml blood was transferred in vial with anticoagulant (Heparin-1ml/10 ml blood) for haematological studies and 3 ml blood was transferred in sterile vial for separation of the serum for biochemical studies. Alterations in the values were observed by using auto analyzer.
For differential count, the smears from fresh whole blood were prepared and stained by Leishman's stain and examined under oil immersion objectives [7].

Results
The commonly observed clinical signs in parvovirus infection were anorexia, diarrhoea, vomiting and depression. The frequent hematological abnormalities observed in parvovirus infection were anemia. In the present study, the mean value of hemoglobin was decreased significantly 10.30 ± 0.35 gm% when compared with the healthy dogs 13.13 ± 0.20 gm%. The mean value of packed cell volume in affected dogs was decreased significantly 36.96 ± 0.92% when compared with the healthy dogs 41.75 ± 0.53%. The mean value of TEC was significantly decreased 5.52 ± 0.17 (10^6/ml) when compared with the healthy dogs 6.14 ± 0.09 (10^6/ml). The mean value of neutrophil and eosinophil in affected dogs was significantly

increased 68.50 ± 0.58% and 4.37 ± 0.21% when compared with the healthy dogs 64.13 ±0.30% and 3.38 ± 0.18 respectively. The mean value of monocyte and lymphocyte was significantly decreased 3.54 ± 0.22% and 23.04 ± 0.40% when compared with the healthy dogs 4.50 ± 0.19% and 25.13 ± 0.30% respectively. The mean value of total protein was significantly decreased in affected dogs 4.85 ± 0.24 (g/dl) when compared with the healthy dogs 6.20 ± 0.09 (g/dl). The mean value of albumin and globulin was significantly decreased in affected dogs 3.39 ± 0.14 (g/dl) and 2.16 ± 0.07 (g/dl) when compared with the healthy dogs 4.09 ± 0.04 (g/dl) and 2.54 ± 0.02 (g/dl) respectively. The mean value of ALT and AST was significantly increased in affected dogs 59.83 ± 3.58 (U/L) and 60.08 ± 3.57 (U/L) when compared with the healthy dogs 54.88 ± 1.46 (U/L) and 43.63 ± 0.98 (U/L) respectively (Table 2).

Table 1: Clinical findings

S. No.	Clinical signs	No. of dogs	Percent (%)
1.	Anorexia	62	87.32
2	Body temperature		
	a. Decreased	30	42.25
	b. Normal	36	50.70
	c. Increased	05	07.04
3.	Vomiting	71	100
4.	Diarrhoea		
	a. Haemorrhagic	61	85.91
	b. Non-haemorrhagic	10	14.08
5.	Colour of conjunctival mucus membrane		
	a. Pink	55	77.46
	b. Pale	16	22.53
6.	Dehydration (%)		
	a. Mild (4-6%)	21	29.57
	b. Moderate (6-8%)	33	46.47
	c. Severe (8-10%)	17	23.94
7.	General body condition		
	a. Excellent	0	
	b. Good	34	47.88
	c. Poor	37	52.11

Statistical analysis

The data were analyzed statistically by using analysis of variance (ANOVA), chi square test and Fisher Pair wise Comparison as per the standard statistical design outlined by Snedecor and Cochran [29].

Discussion

Haematological parameters

Mean Hb concentration (mg/dl) and mean TEC (million/ µl) decreased in the CPV affected dogs and these observations simulated with the findings of Rai *et al.* [16], Ramprabhu *et al.* [16], Biswas *et al.* [3], Kaur *et al.* [8] and Sagar *et al.* [20]. CPV damage the capillary of the villi of intestine leading to loss of blood, which is responsible for the reduced Hb concentration and TEC. While Baruah *et al.* [1] stated that reduction in Hb concentration and TEC values were due to severe haemorrhagic enteritis. Additionally low Hb concentration and TEC values could be due to decreased erythropoiesis as a result of direct effect of CPV on the bone marrow (Boosinger *et al.*, [4].

The TLC (thousand/µl) was significantly lower in CPV affected dogs in comparison to healthy control dogs. Sagar *et al.* [19], Sharma *et al.* [23], Mosallanejabad *et al.* [13], Bastan *et al.* [2]and Dongre *et al.* [6] also reported the same findings.

Among the DLC (%) significant increase in neutrophil (%) and decrease in lymphocyte (%) and monocytes (%) was noticed in the affected dogs while no significant changes were seen in eosinophil (%)These findings were supported by Ramprabhu *et al.* [17], Sagar *et al.* [19] and Dongre *et al.* [6]The significant increase in neutrophil (%) was seen in CPV affected dogs. This finding was matches with the findings of Ramprabhu *et al.* [17], Biswas *et al.* [3], Sagar *et al.* [20] and Dongre *et al.* [6], however, Mosallanejad *et al.* [13] reported decrease in neutrophil (%). This increase in neutrophil might be due to the secondary bacterial infections associated with the Parvoviral enteritis (Biswas *et al.* [3]). In the present study the lymphocyte (%) was significantly lower in CPV affected dogs. These observations simulated with the findings of Ramprabhu *et al.* [17], Biswas *et al.* [3], Sagar *et al.* [20] and Dongre *et al.* [6], Mosallanejad *et al.* [13]. According to Mc Candish [12] and Chakrabarti [5] the decrease in lymphocyte (%) might be due to the virus replication in the lymphoid organs resulting in lyphocytolysis. No significant changes were noted in monocyte (%), eosinophil (%) and basophil (%).These findings were supported by Ramprabhu *et al.* [17], Biswas *et al.* [3], Sagar *et al.* [20] and Dongre *et al.* [6], Mosallanejad *et al.* [13] while, Bastan *et al.* [2] reported reduction in monocyte (%).

In the affected dogs the PCV (%) was significantly lower than healthy dogs. Similar observation was seen by Ramprabhu *et al.* [17]; Kaur *et al.* [8]; Shah *et al.* [22]; Salem [21]. According to Biswas *et al.* [3] and Kumar *et al.* [9] decreased PCV count in parvovirus infection may be due to blood loss and fluid loss through vomiting and diarrhoea during the disease. Roy *et al.* [18] and Kumar *et al.* [9] found gradual increase in packed cell volume when affected dogs were treated with antibiotic along with fluid therapy.

Anemia, leucopenia may be because of virus affects bone marrow and is cytoyoxic for hematopoietic cell leading to myeloid and erythroid hypoplasia during acute stage of the disease. The haematological changes are widely accepted to be attributable to destruction of hematopoietic progenitor cells of the various leukocyte types in the bone marrow and other lymphoproliferative organs such as the thymus, lymph node and spleen.

Biochemical parameters

The present study revealed that the TP (g/dl), albumin (g/dl) and globulin (g/dl) levels were significantly lower in CPV infection Such findings were also recorded by Ramprabhu *et al.* [17], Biswas *et al.* [3], Sagar *et al.* [20] and Baruah *et al.* [1] while increase in albumin level were recorded by Massare *et al.* [11]. This decrease in TP in CPV infection probably due to the leakage of serum protein through damaged capillaries of the villi of intestine and also due to less absorption through the damaged villie. According to Prittie [15] the lower serum protein level might be due to protein loss through the gastrointestinal tract.

A significant increase in total bilirubin level was observed. The study is in accordance to the findings of Nakul [14], who also reported the increase level of serum bilirubin. This change may be attributed due to the hemolysis and cellular damage to splenic and hepatic cells.

There was high rise in ALT (U/L) and AST (U/L) activity seen in CPV infection. These findings corroborates with those of Kaur *et al.* [8], Baruah *et al.* [1] and Bastan *et al.* [2]. This increase in ALT and AST activity in CPV infection seen as AST and ALT are liver specific enzymes. Elevation in these enzymes may occur as a result of hepatic hypoxia secondary to severe hypovoleumia or the absorption of the toxic substance of the gut barrier (Macintire and Smith, [10]).

Table 2: Haematobiochemical values in parvovirus infection

Parameters	Units	Mean ±SE (n=32)	Observation range	Reference range
Haemoglobin	g/dl	10.30 ± 0.35	8.44 – 13.46	12 – 18
PCV	%	36.96 ± 0.92	31.25 – 42.25	37 – 55
TEC	×106/µl	5.52 ± 0.17	4.48 – 6.38	5.5 – 8.8
Neutrophil	%	68.50 ± 0.58	64.13 – 71.75	60 –70
Eosinophil	%	4.37 ± 0.21	3.13 – 5.75	2 – 6
Lymphocyte	%	23.04 ± 0.40	21.00 – 25.50	30 – 40
Monocyte	%	3.54 ± 0.22	2.38 – 4.75	3 – 7
Total protein	g/dl	4.85 ± 0.24	3.53 – 6.25	5.3 – 7.6
Albumin	g/dl	3.39 ± 0.14	2.54 – 4.10	3.2 – 4.2
Globulin	g/dl	2.16 ± 0.07	1.56 – 2.59	2.0 –3.1
Total bilurubin	mg/dl	0.87 ± 0.10	0.24 – 1.45	0.2 – 1.3
Alanine aminotransferase	IU/L	59.83 ± 3.58	52.38 – 110	10 – 90
Aspartate aminotransferase	IU/L	60.08 ± 3.57	39.00 – 81.25	10 – 60

Conclusion

In the present study, commonly observed clinical finding in the canine parvovirus infection were anorexia, depression, bloody diarrhoea and vomiting. The frequent hemato-biochemical abnormalities observed in parvovirus infection were anemia, neutrophilia and eosinophilia. There were significant decreases in the Hb, PCV, TEC and total protein value; while increases in the level of ALT, AST and bilirubin in the severely affected dogs.

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