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Clinico-Biochemical Alterations and Therapeutic Management of Canine Gastroenteritis

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ABSTRACT

The clinical investigation was done on 45 dogs suffering from gastroenteritis. The affected dogs showed diarrhoea, vomition, depression, anorexia and dehydration. Significant decrease in plasma glucose, albumin, potassium and chloride were observed. The affected dogs were randomly divided into three groups. In group-I (n = 15), levofloxacin was given along with antiemetic, vit B-complex and fluid therapy. In group-II (n = 15) and group-III (n = 15), cefotaxime and ceftriaxone were used instead of levofloxacin. The present investigation showed that therapeutic regimen in group-I (levofloxacin) was most effective for the treatment of gastroenteritis as compared to group-II (cefotaxime) and group-III (ceftriaxone).

Keywords*:* Antibiotic, canine, gastroenteritis, management, therapeutic

Among gastrointestinal disturbances, gastroenteritis is the commonest disease which is encountered in all breeds and age group of canine population. It is characterized by anorexia, vomition, diarrhoea which may be haemorrrhagic, and dehydration. Weight loss or stunting is seen in dogs that are more severely affected (Hall, 2011 and Bhat *et al.,* 2013). Irrespective of etiology, gastroenteritis leads to electrolyte imbalance and dehydration. Various factors like bacterial and viral infections, parasitic infestations, irritant drugs, dietary errors and ingestion of toxic materials have been reported to be associated with canine gastroenteritis (Ettinger and Feldman, 2010). Among various causes, canine parvovirus (CPV) is the frequent etiology, particularly in young dogs. CPV is the most dangerous and contagious virus that affects unprotected dogs. CPV-2, the causative agent of acute haemorrhagic enteritis and myocarditis in dogs, is one of the most important pathogenic viruses with high morbidity (100%) and frequent mortality upto 91% in untreated pups (Bhat *et al.,* 2012). The present paper describes the clinico-biochemical alterations and therapeutic management in canine gastroenteritis.

MATERIALS AND METHODS

A total of 45 dogs of different breeds, presented in the College Veterinary Clinics suffering from gastroenteritis were evaluated. Detailed clinical manifestations and clinical parameters were recorded. About 1 ml blood was taken in sterile syringes containing disodium salt of ethylenediamine-tetra acetic acid (EDTA, 1mg/ml) and about 3-4 ml in sterile heparinized syringes aseptically from cephalic or recurrent tarsal vein, before any treatment was instituted. Samples with EDTA were used for haematological studies. Immediately after collection, plasma was separated from heparinized blood by centrifuging at 3000 rpm for 10 minutes. Haemoglobin (Hb), packed cell volume (PCV), total erythrocytic count (TEC) and total and differential leucocytic counts were determined using standard methods as described by Jain (2000).

Biochemical and electrolytes estimations were carried out by using commercially available kits. Globulin was estimated as per method given by manufacturer. Plasma

Table 1. Biochemical profile in canine affected with gastroenteritis (Mean ± S.E.).

Parameters	Control (n=12)	Pre-Treatment Values (n=10)	Post-Treatment Values (n=10)
Glucose (mg/dl)	104.62 ± 2.19 [a]	80.88 ± 3.07[b]	83.14 ± 3.36[b]
Total protein (g/dl)	7.01 ± 0.18	6.70 ± 0.43	6.36 ± 0.37
Albumin (g/dl)	3.62 ± 0.13[a]	2.37 ± 0.12[b]	2.40 ± 0.24[b]
Globulin (g/dl)	3.36 ± 0.11[a]	4.33 ± 0.39[b]	3.95 ± 0.26[ab]
A:G ratio	1.08 ± 0.04[a]	0.58 ± 0.04[b]	0.65 ± 0.06[b]
Blood Urea Nitrogen (mg/dl)	10.92 ± 0.93[a]	37.50 ± 6.02[b]	14.45 ± 2.48[a]
Creatinine (mg/dl)	0.72 ± 0.06	0.76 ± 0.11	0.74 ± 0.06
AST (IU / L)	26.42 ± 2.71	30.56 ± 3.18	33.86 ± 3.57
ALT (IU / L)	23.50 ± 3.61	34.04 ± 4.01	34.85 ± 3.60
Sodium (mmol/l)	146.47 ± 3.06	141.89 ± 2.14	145.09 ± 1.98
Potassium (mmol/l)	3.69 ± 0.24[a]	2.18 ± 0.17[b]	2.69 ± 0.20[b]
Chloride (mmol/l)	99.08 ± 1.81[a]	78.50 ± 2.95[b]	91.51 ± 2.41[a]

Values with different superscripts in a row differ significantly ($P < 0.05$).

Table 2. Comparative therapeutic efficacy of different groups in canine gastroenteritis

(Mean S.E.).

S.No.	Parameters	Gp.I (n=15)	Gp.II (n=15)	Gp.III (n=15)
1.	Mean minimum number of doses of antibiotic for total cessation of diarrhoea.	1.13 ± 0.35	2.00 ± 0.16	2.33 ± 0.21
2.	Mean minimum days of antibiotic treatment for total cessation of diarrhoea.	1.13 ± 0.35	1.20 ± 0.10	1.26 ± 0.11
3.	Failure of treatment in controlling diarrhoea.	Nil	Nil	Nil

biochemicals were estimated on Microlab 300 Clinical Chemistry Analyser (by Merck Limited, Mumbai, India). Blood was also collected from twelve healthy dogs for establishing control values to compare the data. The data obtained were subjected to statistical analysis by using computer software Instat from Graphpad software, 2008. The animal care and the protocol for use of healthy dog as control were approved by the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA).

The affected dogs were randomly divided in 3 groups. Each group was given an antibiotic, antiemetic, vitamin B-complex and fluid therapy. In group I, the affected dogs were treated with combined therapy comprising inj. Levofloxacin (Meriflox) @ 5 mg/ kg b wt iv o d for 3 days, inj. Ondansatron (Periset) @ 0.2 mg/ kg b wt im or iv bid for 2 days, inj. Ethamsylate (K-stat) @ 10 mg/kg b wt bid im or iv for 2 days, inj. vit. B-complex (Tribevet) @ 1.0 to 1.5 ml im on alternate days (3 occasions) and fluid therapy consisting of Ringer's lactate and / or dextrose normal saline @ 20 ml/kg b wt iv for 3 days. In group II, Cefotaxime (Taxim) was administered @ 30 mg/kg b wt iv or im bid for 3 days and rest of the treatment was same as in group I. In group III, Ceftriaxone (Intacef) was administered @ 20 mg/kg b wt bid im or iv for 3 days and all other drugs remained same as in group I.

RESULTS AND DISCUSSION

Among the affected dogs, maximum occurrence was recorded in younger age group. In the present investigation 86.66 per cent dogs were below one year of age and 95.55 per cent dogs were below 3 years of age. The incidence of gastroenteritis was much more in males (68.88 %) than females (31.12%). Haemorrhagic diarrhoea was observed in 68.88 per cent cases and haemorrhagic vomition in 13.33 per cent cases. Forty (88.88%) dogs were observed clinically dehydrated, out of which six (13.33%) dogs were mild dehydrated (+), 30 (66.66%) were moderately dehydrated (++) while 4 (8.88 %) were severely (+++) dehydrated. The respective mean values of haemoglobin, packed cell volume, total erythrocytic count and total leucocytic count were estimated 14.02 ± 0.54 g/dl, 45.15 ± 1.82 %, 6.31 ± 0.18 $X10^6$/µl and 10.10 ± 0.85 $X10^3$/µl. Differential leucocytic count revealed significant ($P < 0.05$) neutrophilia (70.55 ± 1.17 %) and lymphopenia (20.00 ± 0.89 %) as compared to control group (n=12) with neutrophilic and lymphocytic count as 65.00 ± 1.71 % and 25.66 ± 1.54 %, respectively.

Biochemical analysis showed significant ($P < 0.01$) decrease in the value of glucose (80.88 ± 3.07 mg/dl) as compared to control value (104.62 ± 2.19 mg/dl, Table 1). The levels of potassium and chloride (2.18 ± 0.17 mmol/l and 78.50 ± 2.95 mmol/l) were also significantly decreased as compared to control values (3.69 ± 0.24 mmol/l and 99.08 ± 1.81 mmol/l), respectively. After treatment, the dogs became active, alert and improved appetite after 1 to 3 days. Post treatment biochemical profile revealed significant decrease in BUN at 48 hours of treatment (Table 1) and improvement in hydration status was also noticed in all the cases.

The mean minimum doses (average number of doses after which diarrhoea stopped) of levofloxacin, cefotaxime and ceftriaxone for cessation of diarrhoea were 1.13 ± 0.35, 2.00 ± 0.16 and 2.33 ± 0.21. Group II and group III were quite comparable in this regard.

Maximum occurrence of gastroenteritis was observed in younger age group of dogs. This might be due to more activity than adults and their inquiring nature. They may unnecessarily try to eat or feel things around them which may ultimately getting an infection or ingesting some foreign objects leading to GIT disturbances or due to weaning stress (Macartney *et al.,* 1984). Also, at this stage of life they usually come out from their shelter places and start roaming their neighbourhood more frequently, thus chances of ingesting garbage and acquiring infection is more as compared to adult one (Strombeck and Guilford, 1991).

Alves *et al.* (1998) concluded that dogs less than 12 months of age were at increased risk of developing the haemorrhagic gastroenteritis (90.8%). The incidence of gastroenteritis was much more in males than females which corroborates with the findings of Jani (2004), Saxena *et al.* (2006) and Tajpara *et al.* (2009).

Further, the population of sexually intact males may be higher than intact females. Varsheney (2001) concluded that incidence of roaming and dominance aggression directed towards other dogs is comparatively high in males. However, no significant sex variation in haemorrhagic gastroenteritis was noticed by Alves *et al.* (1998) and Banja *et al.* (2002). Most of the dogs were found dehydrated as reported earlier (Sharma, 2003; Saxena *et al.,* 2006). This was due to more fluid loss through diarrhoea as well as vomitus in gastroenteric dogs. Mean PCV value was significantly ($P < 0.05$) higher as compared to control group indicating dehydration. TLC was non-significantly increased which may be due to general reaction of immune system to bacterial infection and inflammatory processes in GIT. Neutrophils were significantly ($P < 0.05$) increased while lymphocytes were significantly ($P < 0.05$) decreased. This corroborates with the findings of Jacobs *et al.* (1990) who reported neutrophilia with increased band cells and lymphopenia in dogs with diarrhoea and vomition.

Biochemical analysis showed significant hypoglycaemia which might be due to inappetance/anorexia (Coles, 1986) complemented by malabsorption from intestine (Shinde *et al.,* 2000). Increased blood urea nitrogen reflects pre-renal uremia probably due to reduced rate (GFR) because of haemoconcentration and also due to catabolic breakdown of tissues as a result of fever (Coles, 1986). Hypokalaemia observed might be due to loss of potassium in the diarrhoeic fluid along with sodium and bicarbonate. Moreover, the colon conserves sodium, but not potassium and is lost in excess leading to hypokalaemia (Yoxall and Hird, 1980). Hypochloraemia might be due to severe loss of chloride ions through vomition (Hoskins *et al.,* 1998) and loss of chloride ion in the secretion of intestinal fluid during diarrhoea.

After treatment, the dogs were active, alert and there was improvement in appetite after 1 to 3 days. Post-treatment biochemical profile revealed significant decrease in BUN at 48 hours of treatment (Table 1) and was comparable to control group indicating improvement in hydration status. There was significant increase in plasma chloride concentration at 48 hours of treatment. The concentration of plasma glucose was increased marginally at 48 hours post treatment indicating improvement in appetite following treatment, whereas there was non-significant decrease in plasma creatinine level at 48 hours post-treatment (Table 1) indicating increase in GFR following treatment.

Broad spectrum antibiotic to combat the secondary bacterial infection, Ondansatron (Periset) injection to stop vomition, Ethamsylate (K-stat) as haemostatic and multivitamin (Tribevet) to tone up the condition of the animal were used. Dogs suffering from canine gastroenteritis were given ringer's lactate and dextrose normal saline. The choice of fluid was based on the fact that major electrolyte deficiencies are of bicarbonate, chloride and sodium along with water. It also helps in correcting the metabolic acidosis generally observed in gastroenteritis (Sharma, 2003). Lactated ringer's solution approximates closely to composition of extracellular fluid which is lost in gastroenteritis condition and corrects the electrolyte imbalance specially the bicarbonates as lactate metabolise to bicarbonate (Waterman, 1991) and this solution contains 28 mEq/l of HCO_3 as lactate. The lactate component of Ringer's lactate provide physiological buffering as it undergoes hepatic metabolisation to carbon dioxide and water, two hydrogen ions being removed from the body for each lactate ion in the process (Yoxall and Hird, 1980). The dextrose normal saline was included to check the maintenance requirement of water and sodium (Yoxall and Hird, 1980) and to overcome the intracellular hypoglycaemia which could occur along with endotoxaemia (Baruah *et al.,* 2005).

The comparative therapeutic efficacy of different groups used in canine gastroenteritis has been presented in Table 2. Based upon the clinical improvement of the cases and the overall cure rate, therapeutic regimen of group-I (levofloxacin) was found most effective in the treatment of canine gastroenteritis as this treatment could control both diarrhoea and vomition in all cases and led earlier recovery as compared to group II (cefotaxime) and group III (ceftriaxone). Cefotaxime and ceftriaxone were also found effective in all the cases but mean number of days for recovery was slightly higher as compared to levofloxacin. In the present study, these findings also simulated to the *in vitro* sensitivity of associated bacteria in which levofloxacin (100 %) and ceftriaxone (91.66 %) were highly sensitive. In Corroboration to the present observations, Wael (2011) also reported good efficacy of levofloxacin in the treatment of haemorrhagic gastroenteritis in dogs.

CONCLUSION

This study was conducted on dogs presented with the history of gastroenteritis. Haemoconcentration, neutrophilia and lymphopenia was observed in dogs affected with gastroenteritis. Biochemically, hypoglycemia, hypoproteinemia, hypokalemia, hypochloremia and increase in BUN was observed. Therapeutically, levofloxacin along with fluid and supportive therapy proved most effective in dogs suffering from gastroenteritis.

REFERENCES

Alves, P. A. B., Rosa, I. C. A. S., Modena, C. M. and Caetano, Junior. 1998. Occurrence of haemorrhagic gastroenteritis in dogs in Belo Horizonte, Minas Gerais, Brazil. *Arquivo Brasileiro deMedicina Veterinaria-e-Zootenia*., **50**: 661-664.

Baruah, M. S., Hazarika, G. C. and Chakravarty, P. 2005. Haematological profile in canine parvovirus infection. *In. Vet. J*., **82**: 332-333.

Banja, B.K., Sahoo, N., Panda, H.K., Ray, S.K. and Das, P.K. 2002. Epizootiological status of canine viral haemorrhagic gastroenteritis in Bhubaneswar city. *Ind. Vet. J*., **79**: 850-851.

Bhat, A. A., Wadhwa, D. R., Sheikh, I. and Chander, V. 2012. Plasma concentration of creatine kinase-MB isoenzyme in dogs with intestinal form of canine parvovirus-2 infection. *Comp. Clin. Pathol*., **21** (6): 1-5.

Bhat, A.A., Wadhwa, D.R., Singh, S.P. and Singh, I. 2013. Haematological and biochemical analysis in canine enteritis. *Vet. World*., **6** (7): 380-383.

Coles, E. H. 1986. Veterinary Clinical Pathology. (4th). Edition, W.B Saunders Company, Philadelphia, pp. 80-96.

Ettinger, J. S. and Feldman, E. C. 2010. Text Book of Veterinary Internal Medicine: Diseases of Dog and Cat. (6th). Edition, W.B. Saunders Company, Philadelphia, pp. 1310-1408.

Hall, E. J. 2011. Antibiotic-Response diarrhoea in small animals. *Vet. Clin. Sm. Anim*., **41**: 273-286.

Hoskins, J. D. 1998. Canine viral enteritis. In: Infectious diseases of the Dog and Cat. Editor (Greene, C. E.), 4th Edition., W.B. Saunders Co, Phildelphia, pp. 40-49.

Jacobs, G., Collins, K. L., Lappin, M. and Tyle, D. 1990. Lymphocytic-plasmocytic enteritis in 24 dogs. *J. Vet. Int. Med*., **4**: 45-53.

Jain, N. C. 2000. Leukocytes. In: Schalm's Veterinary Haematology. Editors (Douglas, J. W. and Wardrop, K. J.), 5th Edition., Lea and Febiger, Phildelphia, USA. pp. 35-36.

Jani, R. J. 2004. Epidemiological study of diarrhoea in dogs of Gujarat state. *Indian Vet. J*., **81**: 800-802.

Macartney, L., McCandlish, I. A. P. and Thomson, H. 1984. Canine parvovirus enteritis 1: clinical, haematological and pathological features of experimental infection. *Vet. Rec*., **115**: 201-210.

Saxena, R., Dua, K., Uppal, S. K., Saini, N. and Kumar, A. 2006. Effect of fluid therapy and lignocaine in management of gastro-enteritis in dogs. *Indian J. Vet. Med*., **26**: 81-85.

Sharma, A. 2003. Clinical and therapeutic studies on canine gastroenteritis. M.V.Sc.Thesis, Department of Veterinary Medicine, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, India.

Shinde, S. S., Rajguru, D. N., Anantwar, L.G., Mohd, S. and Ambore, B. N. 2000. Clinico-pathology and therapeutic management of canine gastroenteritis. *The blue cross book*., **15**: 26-29.

Strombeck, D. R. and Guilford, W. G. 1991. Small Animal Gastroenterology. Wolfe Publishing Limited, London.

Tajpara, M. M., Jhala, M. K., Rank, D. N. and Joshi, C. G. 2009. Incidence of canine parvovirus in diarrhoeic dogs by polymerase chain reaction. *Indian Vet. J*., **86**: 238-241.

Varshney, J. P. 2001. Aberrant canine behaviours An-overview. *Indian J. Vet. Med*., **21**: 1-9.

Wael, M. K. 2011. Field trial evaluation of Levofloxacin and erythropoietin in treatment of haemorrhagic enteritis in dogs. *Life Sci. J*., **8**: 414-422.

Waterman, A. E. 1991. Fluid therapy and intensive care. In: Canine Medicine and Therapeutics, Editor (Chandler, E. A.), Blackwell Scientific Publications, Oxford, PP. 103-140.

Yoxall, A.T. and Hird, J. F. R. 1980. Physiological Basis of Small Animal Medicine. Blackwell Scientific Publication, Oxford, pp. 270-284.