The Haryana Veterinarian (June, 2024) **63(1),** 10-15 ISSN 0033-4359 (P) **Research Article**

A STUDY ON ALTERATIONS IN PHYSIOBIOCHEMICAL PARAMETERS OF ASCITES IN DOGS

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ABSTRACT

This study was conducted at the Multispecialty Veterinary Hospital (MSVH) of Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, focusing on 32 clinical cases of dogs suspected to have ascites. For each case, blood, peritoneal fluid, and urine samples were collected to perform comprehensive haemato-biochemical analyses. Results revealed that ascites was more frequently observed in male dogs compared to females. Hepatic and cardiac origins were identified as the most common causes of ascites in both males and females. Labrador Retrievers and young dogs, particularly those aged 3 to 6 years, had the highest incidence of ascites. Survival analysis revealed highest survival rate of peritonitis induced ascites (50%) followed by hepatic (33.33%) and cardiac (33.33%) origin. Recovery was the highest (50%) in young dogs aging <3 years. Haemoglobin, PCV and TEC of ascitic dogs involving kidney was decreased while creatinine and BUN were significantly higher ($P<0.05$) compared to ascitic dogs with other etiologies. Serum ascites albumin gradient (SAAG) and canine atrial natriuretic peptide (ANP) values were found to be highest in hepatic and cardiac origin ascites, respectively. Conclude to the study that prognosis was generally poor in ascites cases while grave in renal ascites.

Keywords: Ascites, Dogs, SAAG, UPC, Canine ANP

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The normal abdomen houses organs that are bathed in a certain amount of intra-abdominal fluid. This fluid keeps the tissues and cells moist and healthy, maintains sterile environment for the organs and helps to fight infection. Additionally, it promotes the cellular renewal and tissue repair (O'Brien & Lumsden, 1988). Accumulation of excessive free fluid in the abdomen resulting in its distension is referred to ascites. Ascites is not a disease in itself but rather a syndrome or clinical sign that arises secondary to other underlying conditions. These conditions include chronic hepatic failure, congestive heart failure, nephrotic syndrome, malnutrition, ancylostomiasis, and protein-losing enteropathy. (Turkar *et al.*, 2009), multiple organ disorders, hypoprotenemia (Padhi *et al.*, 2022; Dabas *et al.*, 2011) and right side heart failure (Ettinger & Suter, 1970) in dogs.

In ascites, a common finding is hypoproteinemia, particularly hypoalbuminemia. Albumin is a key protein that helps to maintain the oncotic pressure of blood, which is essential for keeping fluid within the vascular system. When albumin levels drop, the oncotic pressure decreases, which can lead to fluid leakage from the blood vessels into the abdominal cavity, resulting in ascites (Gines *et al.*, 2010). Ascites can lead to difficulty in respiration due to abdominal distension. The excessive fluid accumulation in the abdominal cavity can cause the abdomen to expand, which in turn puts pressure on the diaphragm and limits the ability of the lungs to expand fully. This can alter the normal respiratory pattern typically from thoracic to thoraco- abdominal (Nwoha, 2019). On physical examination, distended pear shaped abdomen is observed (Jana *et al.*, 2019). As ascites may involve multiple organ disorders, it becomes essential to differentiate the systems involved which will ultimately help the veterinarian to understand the origin of the ascites and its treatment in the best possible manner. In view of the above, the present investigation was carried out with the objective to study the various physio-biochemical parameters involved in ascites in dogs.

MATERIAL AND METHOD

The present study was conducted from November 2020 to June 2021, involving 32 clinical cases presented at the Multispecialty Veterinary Hospital (MSVH) of Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana. These cases were suspected of having ascites. Suspected dogs were selected based on the abdominal distension, out of which 2 were diagnosed with organomegaly and 30 were confirmed to have ascites. All the dogs were followed till recovery or death, whichever was earlier. Blood samples were collected from the ascitic dogs both before and after the t reatment for comprehensive hematological and biochemical analysis. The pre-treatment samples were used to assess baseline values, while the post-treatment samples were analyzed to evaluate the effectiveness of the treatment and any changes in hematological and biochemical parameters. All the dogs except for one were followed till recovery through the post treatment visits of the patients in MSVH.

Blood was collected from cephalic or saphenous vein in a sterile K_3EDTA vial for haematological analysis

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and in a test tube without an anticoagulant for estimation of biochemical parameters. Blood samples were collected in tubes without anticoagulant and allowed to stand in a slanting position for 30 minutes to promote clotting. Following clot formation, the samples were centrifuged at 2500 rpm for 10 minutes to separate the serum from the cellular components. The harvested serum was then transferred to eppendorf tube in multiple aliquots. These aliquotes were stored in deep freezer at -20ºC for biochemical analysis and -80 ºC for canine atrial natriuretic peptide (ANP) and total bile acid (TBA) estimation. Further, hemoglobin (Hb) (g/dL), packed cell volume (PCV) (%), total erythrocyte count (TEC)($\times 10^6/\mu L$) and total leucocyte count (TLC) ($\times 10^3/\mu L$) were estimated by fully automatic laser based haemtology analyser. Biochemical parameters were estimated using Virtos DT 350 Chemistry system using commercial dry kits. Biochemical analysis including renal profile was done by estimating blood urea nitrogen (BUN) and creatinine (Cr) as well as liver profile by estimating alanine aminotransferase (ALT) and aspartate aminotransferase (AST). Other parameters estimated included total protein (TP) and albumin. For canine ANP and TBA, serum samples stored at -80ºC were thawed at room temperature and ELISA was done using commercial kitfrom Bioassay Technology Laboratory (BTL) as per manufacturer's instructions. Readings were taken using Thermo Fisher Scientific's spectrophotometer at 450 nm.

Peritoneal fluid was collected using abdominocentesis with left lateral recumbent position. Urinary bladder was emptied and then peritoneal fluid was collected from the area 2 to 3 cm caudal and left to the midline with the help of a needle. A four quadrant abdominocentesis was used,which involve four sites: right cranial quadrant, left cranial quadrant, right caudal quadrant, and left caudal quadrant. Total leukocyte count in peritoneal fluid was done using Fully Automatic Laser Based Hematology Analyzer (ADVIA ® 2120 Haemtology system, Siemens Healthcare diagnostics Inc., USA). The sample was centrifuged at 3000 rpm for 5 minutes. The supernatant was used for the estimation of protein and albumin using Virtos DT 350 Chemistry system using commercial kits (Ortho Clinical Diagnostics, Johnson & Johnson Company) and the values were expressed in g/dL. The Serum-Ascites Albumin Gradient (SAAG) is calculated by subtracting the albumin concentration in the ascitic fluid from the serum albumin concentration. A higher SAAG indicates that the ascites is more likely due to portal hypertension, whereas a lower SAAG suggests other causes of ascites, such as malignancy or infection.

Canine urine samples were collected in sterilized plastic vials using the standard procedure followed at Multispecialty Veterinary Hospital, GADVASU. Urine protein and creatinine were determined in collected urine samples by Virtos DT 350 Chemistry systemusing commercial kit and values were expressed in mg/dL and Urine Protein-Creatinine (UPC) ratio was then calculated.

The collected data was arranged in tabular form and statistical analysis was done using SAS and SPSS 26.0 software. Duncan's Multiple Range Test and Student's Paired t-Test were performed to determine significant differences ($P < 0.05$) among the different groups. Duncan's Multiple Range Test was used for comparing means among multiple groups to identify which specific groups differed, while the Student's Paired t-Test was used to compare means within the same group before and after treatment.

RESULTS AND DISCUSSION

The results obtained from the present investigation are presented in Tables 1 to 5 and Figs. 1-2. The breed wise occurrence of ascites was found to be highest in Labrador Retriever i.e. 13 cases (43.3%), followed by 5 cases of Pug (16.67%), 4 cases of Golden Retriever (13.33%), 2 cases of Shih Tzu (6.67%), 2 cases of Indian Mix Breed (6.67%) and 1 case of American Bully, Cocker Spaniel, German Shepherd and Bull Mastiff each (3.33%) (Table 1). The highest occurrence in Labrador Retriever appeared to be linked to the high proportion of Labrador Retrievers among the cases presented in hospital during that period of study i.e. November, 2020 to June, 2021. This might also be due to the fact that Labrador Retriever is the most common breed kept in and around Ludhiana. The high positivity of ascites and its trend observed in the our study was also investigated by James *et al.* (2008) and Padhi *et al.* (2022) in Labrador Retriever while Nottidge *et al.* (2003) reported highest positivity in German shepherd whereas Fuentealba *et al.* (1997) reported the high ascites occurrence in Doberman Pinscher and Great Dane. In our investigation, the age wise positivity of the ascitic dogs was also observed and age group of 3-6 years had the highest number of ascitic cases (46.67%), followed by of 6-9 years age group (23.33%), of <3 years (20%) and of >9 years age group (10%) (Fig. 1). This trend was also observed by Saravanan *et al.* (2012), where he found that 50% of ascitic dogs fall into 4-5 years age group. Higher occurrence of ascites was found in the younger age group (<3years), by Nottidge *et al.* (2003); James *et al.* (2008) and Turkar *et al.* (2009). They observed severe hypoproteinaemia along with anaemia in young ascitic pups. In contrast to our findings, Padhi and co-workers (2022) found older dogs more susceptible to ascites in their study. High positivity in young dogs in our study can be due to improper diet. Out of the total 30 cases of ascites occurrence recorded in present study in relation to the sex of the dogs, it was observed that the ascetic cases of male dogs had higher number i.e. 19 (63.33%) as compared to

Table 1. Breed and age wise occurrence of ascites in dogs as per systems involved

Breed	Total Cases	Liver (n=21)	Kidney (n=6)	Heart (n=18)	Peritonitis (n=12)
Breed wise occurrence					
Labrador Retriever	13(44.33%)	9 (69.23%)	1(7.69%)	8 (61.54%)	7(53.85%)
Pug	5 (16.67%)	4 (80%)	1 (20%)	2 (40%)	1 (20%)
Golden Retriever	4 (13.33%)	1 (25%)	2 (50%)	3 (75%)	0 (0%)
Shih Tzu	2 (6.67%)	2 (100%)	1 (50%)	0 (0%)	2 (100%)
Non Descriptive	2 (6.67%)	1 (50%)	0 (0%)	2 (100%)	1 (50%)
Cocker Spaniel	1 (3.34%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)
German Shepherd	1 (3.33%)	1 (100%)	1 (100%)	1 (100%)	0 (0%)
American Bully	1 (3.33%)	1 (100%)	0 (0%)	1 (100%)	0 (0%)
Bull Mastiff	1 (3.33%)	1 (100%)	0 (0%)	1 (100%)	1 (100%)
Age wise occurrence					
Below 3	6 (20%)	3(14.28%)	2 (33.33%)	3(16.67%)	2(16.67%)
3-6 Yrs	14 (46.67%)	9(42.86%)	2 (33.33%)	9(50%)	8(66.67%)
6-9 Yrs	7 (23.33%)	6(28.57)	0 (0%)	5(27.78%)	2(16.66%)
9 and above	3 (10%)	3(14.29%)	2 (33.34%)	1(5.55%)	0 (0%)

Table 2. Hematology of ascitic dogs with respect to the systems involved

Parameter	Reference Range*	Liver (n=21)	Kidney (n=6)	Heart (n=18)	Peritonitis (n=12)
Hemoglobin (g/dL)	11.9 - 18.9	7.61 ± 0.63	6.72 ± 1.31	7.62 ± 0.6	8.08 ± 0.68
P.C.V. (%)	35 - 57	24.6 ± 1.58	22.67 ± 3.8	25.26 ± 1.6	26.23 ± 1.83
TEC (10^6/µL)	4.95 - 7.87	4.1 ± 0.23	3.82 ± 0.54	4.27 ± 0.23	4.34 ± 0.24
TLC (10^3/µL)	5.0 - 14.1	27.4 ± 3.6	25.73 ± 3.21	23.83 ± 4.29	31.43 ± 5.6
Neutrophils (10^3/µL)	2.9 - 12.0	24.82± 0.46	23.76± 0.61	20.57± 0.53	28.26± 0.71
Lymphocytes (10^3/µL)	0.4 - 2.9	2.38± 0.47	1.89± 0.62	3.1± 0.54	2.85± 0.72
Eosinophils (10^3/µL)	0 - 1.3	1.84± 0.68	0.85± 0.85	0.13± 0.05	0.31± 0.12
Monocytes (10^3/µL)	0.1 - 1.4	0.27 ± 0.27	0 ± 0	0.02± 0.02	0 ± 0
Platelets (10^3/µL)	211 - 621	266.28 ± 32.55	174.83 ± 28.33	230.72 ± 27.93	311.75 ± 52.04
MCH (pg)	21.0 - 26.2	18.36 ± 0.95	17.24 ± 1.54	17.74 ± 0.95	18.53 ± 1.14
MCV (fL)	66 -77	60.64 ± 2.31	59.62 ± 4.28	59.67 ± 2.59	60.6 ± 2.84
MCHC (g/dL)	32.0-36.3	30.16 ± 1.03	29.08 ± 2.03	29.61 ± 0.94	30.41 ± 0.97

Mean ± S.E. bearing different superscripts in same row differ significantly ($p \leq 0.05$) from each other in one way analysis of variance with Duncan's Multiple Range Test. *From Aiello *et al.* (2016)

Table 3. Haematological analysis of ascitic dogs before and after the treatment/recovery

Parameter	Reference Range*	Before Treatment (n=10)	After Treatment (n=10)
Hemoglobin (g/dL)	11.9 - 18.9	8.69 ± 0.72^a	10.03 ± 0.48^b
P.C.V. (%)	35 - 57	27.17 ±1.66	30.4 ±1.0
TEC (10^6/µL)	4.95 - 7.87	4.66 ± 0.2^a	5.07 ± 0.21^b
TLC (10^3/µL)	5.0 - 14.1	20.77 ±4.46	17.99 ±2.40
Neutrophils (10^3/µL)	2.9 - 12.0	17.92±0.62	15.09±0.51
Lymphocytes (10^3/µL)	0.4 - 2.9	2.72±0.62	2.39±0.43
Eosinophils (10^3/µL)	0 - 1.3	1.25±0.62	0.47±0.27
Monocytes (10^3/µL)	0.1 - 1.4	0 ±0	0.36± 0.36
Platelets (10^3/µL)	211 - 621	340.1 ± 59.63	271.5 ± 41.91
MCH (pg)	21.0 - 26.2	18.58 ± 1.24	20.09 ± 1.29
MCV (fL)	66 - 77	58.21 ± 2.40	60.69 ± 2.96
MCHC (g/dL)	32.0 - 36.3	31.69 ± 1.0	33.08 ± 1.43

Mean ± S.E. bearing different superscripts in same row differ significantly ($p \leq 0.05$) from each other in Student's paired t-test. *From Aiello *et al.* (2016)

Table 4. Serum biochemistry and ascitic fluid analysis of ascitic dogs with respect to the systems involved

Parameter	Reference Range*	Liver (n=21)	Kidney (n=6)	Heart (n=18)	Peritonitis (n=12)
		Blood Serum			
TP (g/dL)	5.4 - 7.5	4.77 ± 0.26^{a}	3.65 ± 0.33^{b}	4.4 ± 0.23^{ab}	4.92 ± 0.29^{a}
Albumin (g/dL)	2.3 - 3.1	1.88 ± 0.12	1.65 ± 0.18	1.74 ± 0.07	1.88 ± 0.15
BUN (mg/dL)	8 - 28	33.52 ± 9.01^{b}	79.83 ± 21.7^{a}	19.22 ± 3.68^{b}	28.33 ± 12.86^{b}
Creatinine (mg/dL)	0.5 - 1.7	1.6 ± 0.4^{b}	4.55 ± 1.3^{a}	0.98 ± 0.13^{b}	1.46 ± 0.6^{b}
ALT (U/L)	10 - 109	148.81 ± 31.18	115.17 ± 24.06	128.56 ± 38.32	94.92 ± 13.36
AST (U/L)	52 - 368	134.28 ± 22.73	145.17 ± 56.91	116.72 ± 20.66	81.58 ± 12.52
Bile Acid (µmol/L)	≤10**	5.92 ± 0.82	7.18 ± 2.47	5.88 ± 0.92	5.34 ± 0.68
ANP (pg/ml)	61.9-112.9***	178.06 ± 16.84	162.41 ± 28.58	233.35 ± 16.06	169.62 ± 19.52
		Ascitic Fluid			
Total Protein (g/dL)	-	1.46 ± 0.17	1.55 ± 0.23	1.36 ± 0.15	1.6 ± 0.27
Albumin (g/dL)	-	0.94 ± 0.06	0.98 ± 0.09	0.92 ± 0.05	1.02 ± 0.11
TLC ($10^3/\mu L$)	-	1.27 ± 0.69	2.63 ± 2.47	0.52 ± 0.13	2.48 ± 1.14
SAAG (g/dL)	<1.1****	0.93 ± 0.11	0.67 ± 0.16	0.83 ± 0.07	0.87 ± 0.1

Mean ± S.E. bearing different superscripts in same row differ significantly ($p \leq 0.05$) from each other in one way analysis of variance with Duncan's Multiple Range Test. *From Aiello *et al.* (2016); ** From Pena-Ramos *et al.* (2021); ***From Hori *et al.* (2020); ****From Saravanan *et al.* (2012)

Table 5. Serum biochemistry and urinalysis of ascitic dogs, before and after the treatment/recovery

Parameter	Reference Range*	Before Treatment (n=10)	After Treatment (n=10)
		Blood Serum	
TP (g/dL)	5.4 - 7.5	4.83 ± 0.28	5.5 ± 0.24
Albumin (g/dL)	2.3 - 3.1	2.02 ± 0.18	2.11 ± 0.11
BUN (mg/dL)	8 - 28	14.4 ± 3.47	15.9 ± 5.03
Creatinine (mg/dL)	0.5 - 1.7	0.80 ± 0.12	0.77 ± 0.09
ALT (U/L)	10 - 109	87.2 ± 13.78^{a}	51.0 ± 5.32^{b}
AST (U/L)	52 - 368	74.1 ± 10.00	60.6 ± 5.58
Bile Acid (µmol/L)	≤ 10**	6.09 ± 0.71	7.21 ± 1.38
ANP (pg/ml)	61.9-112.9***	171.13 ± 23.96	141.58 ± 20.53
		Urinalysis	
UPRO (mg/dL)	-	22.6 ± 9.57	17.3 ± 4.59
Urine Creatinine (mg/dL)	-	50.24 ± 9.48	64.94 ± 11.7
UP:UC	<0.5****	0.45 ± 0.15^{a}	0.27 ± 0.08^{b}

Mean ± S.E. bearing different superscripts in same row differ significantly ($p \leq 0.05$) from each other in Student's paired t-test.
*From Aiello *et al.* (2016); ** From Pena-Ramos *et al.* (2021); ***From Hori *et al.* (2020); ****From Rossi *et al.* (2012)

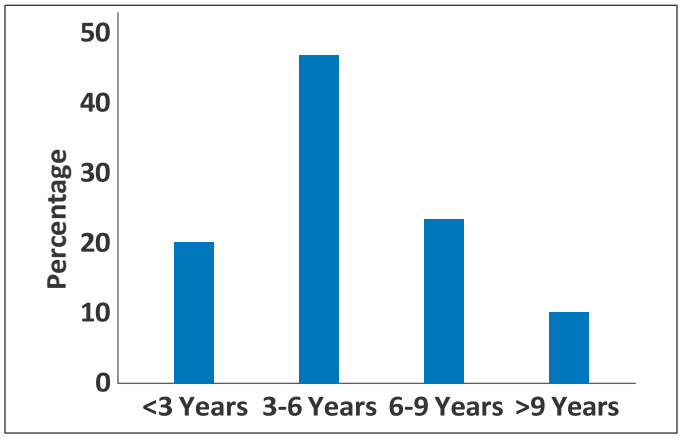

Fig. 1. Age wise occurrence of ascites in dogs.

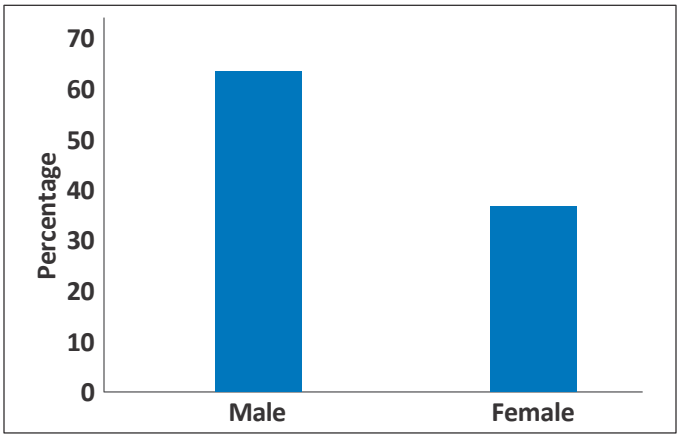

Fig. 2. Sex wise occurrence of ascites in dogs.

the 11 cases (36.67%) of female dogs (Fig. 2). This observation could be attributable to the higher proportion of male dogs in and around Ludhiana might be because of owner's preference to keep male dogs as pets and may influence the prevalence of ascitic conditions in this population. Further studies might be needed to explore the potential gender-related factors contributing to these findings. Similarly, ascites occurrence in higher proportion of male dogs was also observed by Tyagi *et al.* (2004); Gabriel (2009); Gualtieri *et al.* (2009) and Saravanan *et al.* (2012).

The clinical signs were observed and history was taken from the pet owners, who presented their dogs in the hospital and it was observed that melena was a common finding in ascetic dogs. Ascites leads to gastrointestinal bleeding due to portal hypertension, which leads to the black discoloration of stool. 47.62% (10 out of 21 cases) of hepatic and 83.33% (5 out of 6 cases) of renal ascetic dogs were having melena. No case of renal ascites was found to have a normal stool color. Similar findings were observed by Dixit *et al.* (2010) where they observed 100 ascitic dogs with clinical sign of melena. Ascites led to a change in color of urine the dogs, whereas 16 out of 30 ascitic dogs (53.33%) were having dark colored urine which could be due to dehydration. 4 out of 6 dogs (66.67%) suffering from renal ascites were having a dark colored urine.16 ascitic dogs (53.33%) were vomiting with colour of the vomitus varying from yellow (68.75%) to white (12.5%) and blood tinged (12.5%) to black (6.25%). Exercise intolerance was found in 12 dogs (61.11%) suffering from cardiac ascites as these dogs were getting breathlessness very easily even with a simple walk which might be due to cardiac insufficiency. When general examination was done in the ascitic dogs presented to the MSVH, it was observed that 4 ascitic dogs (66.67%) with renal origin were found to be dull. Kidney failure leads to increase in BUN and creatinine in blood that cause metabolic acidosis, due to which dogs presented with renal ascites were dull. 11 dogs (61.11%) with cardiac origin ascites were found to be active. Ettinger & Suter (1970) concluded that valvular fibrosis begins at early years and leads to the cardiac insufficiency in middle years, which lead to the generalized heart failure. In present study, dogs suffering from cardiac ascites were active as cardiac insufficiency progress slowly and body adapts to the changes. Renal ascites had maximum percentage of dogs with pale mucous membrane i.e. 66.67% (4 out of 6 cases), followed by 57.15% (12 out of 21 cases) in hepatic ascites, 55.56% (10 out of 18 cases) in cardiac ascites and 41.67% (5 out of 12 cases) in ascites due to peritonitis. Pale mucous membrane might be attributable to the low Hb level in all the systems involved.

When survival analysis was done in the ascitic dogs, it was found that only 11 dogs (36.67%) were able to survive out of the 30 asciticdogs presented to MSVH. Survival rate was maximum in ascetic dogs suffering from peritonitis (50%), whereas no survivor in renal ascites was observed. Renal ascites had the lowest level of Hb, PCV, TEC, platelets, Mean corpuscular volume (MCV), Mean corpuscular haemoglobin (MCH) as depicted in Table 2. All these changes indicate about grave prognosis in renal ascites. Survival rate was higher in female dogsi.e. 54.54% (6 out of 11 cases) as compared to male dogs i.e. 21.05% (4 out of 19 cases). Recovery rates were highest among young dogs (less than 3 years of age), with a 50% recovery rate observed in this group. This suggests that younger dogs may have a better prognosis or more favorable response to treatment compared to older dogs. It could be due to the fact that major organs responsible for ascites respond faster to the treatment in the younger age.

Haematology was done from the blood of the ascitic dogs presented to the hospital and shown in the table 2 and 3. When Mean±SE of different haematological parameters were compared on the basis of different systems involved, it was found that the dogs suffering from renal ascites had the lowest level of Hb, PCV, TEC, platelets, Mean corpuscular volume (MCV), Mean corpuscular haemoglobin (MCH) and Mean corpuscular haemoglobin concentration (MCHC). Highest TLC and absolute neutrophilia was observed in dogs suffering from ascites due to peritonitis. All the haematological parameters of 10 recovered ascitic dogs when compared with the haematology of the same dogs before treatment (Table 3), revealed a significant ($p<0.05$) improvement in the Hb and TEC of the treated dogs, while, other haematological parameters showed non-significant improvement in the treated dogs. The present investigation revealed decrease in hemoglobin and packed cell volume with neutrophilic leukocytosis in all the systems involved in ascites. Similar trend was observed Kumar *et al.* (2003); Gupta *et al.* (2004); Pradhan *et al.* (2008); Kumar *et al.* (2016); Regmi and Shah (2017) and Padhi *et al.* (2022). The significant decrease in Hb and TEC (Table 2) when compared with normal values before treatment can be due to the blood loss in gastrointestinal bleeding, which was seen as melena.

Biochemical analysis was done from the blood serum of ascitic dogs, which were presented to the hospital for treatment (Table 4 and 5). The Mean±SE of biochemical parameters investigated were compared with respect to the different systems involved and a significant increase ($p<0.05$) in the serum BUN (79.83±21.7 mg/dL) and creatinine (4.55 ± 1.3 mg/dL) was observed in renal ascites when compared with the other systems involved. Similarly, there was a significant decrease ($p<0.05$) in the total protein (3.65±0.33 g/dL) of renal ascites when compared with the other systems involved. There was a

non-significant increase in the canine ANP values (233.35±16.06 pg/ml) of dogs suffering from cardiac ascites. Serum biochemical values of 10 recovered ascitic dogs after treatment were compared with values before treatment (Table 5), which reflected a significant ($p<0.05$) improvement in the ALT. In contrast, all other biochemical parameters showed a non-significant improvement ($p > 0.05$) in the treated dogs.

Peritoneal fluid was collected from the ascitic dogs for the evaluation of TP, albumin and TLC. SAAG value was then calculated using serum and ascitic fluid albumin (Table 4). SAAG value was found to be highest in dogs suffering from hepatic ascites indicating portal hypertension. Thus SAAG can be used to rule out ascites of hepatic origin where values more than 1.1 g/dL indicate portal hypertension (Saravanan *et al.*, 2012). Similar trend was observed by Das *et al.* (1998) and Saravanan *et al.* (2012), where high SAAG (Serum-Ascites Albumin Gradient) values were observed in conditions such as cirrhotic hepatic failure, portal vein thrombosis and cardiac failure. Urinalysis was done from the urine samples of ascitic dogs presented to MSVH to calculate UPC ratio, as depicted in the table 5. It was observed that Mean ± SE of UPC ratio decreased significantly ($p<0.05$) in the recovered dogs (0.27±0.08) when compared with the UPC ratio of same dogs before (0.45±0.15) treatment.

CONCLUSION

It was concluded from the present study that high creatinine and BUN values along with clinical signs is helpful in differentiating the ascites of renal origin from that of hepatic, cardiac and peritonitis origin. Furthermore, the prognosis was found to be poor for ascites in general. However, the prognosis was particularly grave for ascites of renal origin, suggesting a more difficult-to-treat condition in these cases.

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