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# Hematological and serum biochemical variables in canine congestive heart failure

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**Abstract**
Acquired heart diseases (AHD) are common and often fatal when it leads to CHF in dogs and it occurs most often secondary to degenerative Mitral Valve Disease (MVD), Dilated Cardio Myopathy (DCM), Pericardial diseases and Hypertrophic Cardio Myopathy (HCM). Animals with acquired heart diseases were selected from the animals that were brought to MVC teaching hospital and they were grouped as Dilated Cardiomyopathy (DCM), Mitral Valve Disease (MVD), Pericardial diseases, Hypertrophic Cardiomyopathy (HCM). 106 animals with acquired heart diseases were selected and they were grouped as Dilated Cardiomyopathy (DCM), Mitral Valve Disease (MVD), Pericardial diseases, Hypertrophic Cardiomyopathy (HCM). Baseline Haematology panel, Baseline serum biochemistry panel of the cases examined. Haematological assessment showed no significant changes. Serum biochemical assessment showed significant hypernatremia in all groups except HCM.

**Keywords:** Canine, congestive heart failure, haematology, serum biochemistry

## Introduction
Congestive heart failure (CHF) is the inability of the heart to provide adequate circulation to meet the body's needs. It is the end result of a weakened heart muscle. The health of the liver, kidneys, lungs, and other organs is impaired by the CHF, resulting in a problem involving multiple organs. Acquired heart diseases (AHD) are common and often fatal when it leads to CHF in dogs characterized by cardiac dysfunction, neuro-hormonal activation, sodium and water retention and increase in left ventricular (LV) filling pressures (LVFP). It occurs most often secondary to degenerative mitral valve disease (MVD), dilated cardiomyopathy (DCM) and pericardial diseases. Baseline Hematology panel, Baseline serum biochemistry panel of the cases examined.

## Materials and Methods
This study was carried out in the sick dogs brought to Small Animal Clinic, Outpatient Medical Unit of Madras Veterinary College Teaching Hospital, with clinical signs suggestive of cardiac failure and then confirmed by echocardiography. The study consisted of five groups which included apparently healthy dogs and clinical cases of acquired heart diseases with heart failure. All the selected cases were subjected to routine laboratory investigations as per standard clinical laboratory protocols suggested by Gunn and Alleman (2005) [2] as per standard clinical laboratory protocols.

### Baseline Haematology Panel
### Erythrogram
Haemoglobin (Hb), Packed Cell Volume (PCV), Total Erythrocyte Count (TEC), White Blood Cell (WBC) count and Platelet count were estimated.

### Leucogram
Total Leucocyte Count (TLC) and Differential Leucocyte Count (DLC) were estimated.

### Baseline Serum Biochemistry Panel
Blood Urea Nitrogen (BUN), Creatinine, Alanine transaminase (ALT), Alkaline Phosphatase (ALP), Total protein, Albumin, Calcium, Phosphorous, Sodium and Potassium levels in the serum were estimated.

## Results and Discussion

The Erythrogram and leucogram values are presented in Table-I

**Table I:** Mean ± SE Haematological Values in Control and Acquired Heart Disease Cases

| Haemogram | Group - I Control (n=20) | Group – II Dilated Cardiomyopathy (n=58) | Group – III Mitral Valve Disease (n=39) | Group – IV Pericardial Effusion (n=6) | Group – V Hypertrophic Cardiomyopathy (n=3) | F Value |
|---|---|---|---|---|---|---|
| Haemoglobin (g/dl) | 12.84±1.46 | 12.41±0.37 | 12.30±0.40 | 12.25±1.42 | 12.20±2.78 | $1.020^{NS}$ |
| PCV (%) | 40.92±4.44 | 40.44±1.37 | 41.80±1.35 | 43.65±5.96 | 37.60±8.84 | $2.285^{NS}$ |
| RBC (m/cmm) | 5.49±0.42 | 4.49±0.18 | 5.07±0.21 | 4.59±0.70 | 4.41±0.32 | $1.990^{NS}$ |
| WBC ($10^3$/cmm) | 12.76±1.60 | 13.24±0.75 | 12.27±0.71 | 12.67 ±0.47 | 12.00±2.82 | $0.923^{NS}$ |
| Platelets (lakhs/cmm) | 2.47±0.61 | 2.66±0.11 | 2.65±0.14 | 2.63±0.45 | 2.41 ±0.29 | $0.245^{NS}$ |
| Neutrophils | 73.00±2.58 | 73.82±1.06 | 73.76±0.92 | 71.50±2.09 | 72.33±3.84 | $1.896^{NS}$ |
| Lymphocytes | 18.00±2.37 | 19.71±0.81 | 19.21±0.85 | 20.67±2.42 | 19.67±2.19 | $1.562^{NS}$ |
| Monocytes | 3.25±0.70 | 4.06±0.20 | 4.22±0.23 | 4.17±0.70 | 3.33±1.33 | $0.858^{NS}$ |
| Eosinophil | 3.08±0.36 | 3.27±0.17 | 3.08±0.21 | 3.67±0.67 | 3.50±0.50 | $0.742^{NS}$ |

Same superscript in row do not differ significantly
NS Not significant ($P$>0.05)
* Significant ($P$< 0.05)
** Highly Significant ($P$<0.01)

In the current study haematological examination showed no significant changes in dogs with AHDs. It is similar to the findings of Tidholm and Jonsson (1996) [4] and Martin *et al.* (2009) [3]. These authors observed no haematological abnormalities in AHD dogs. The mean ± SE values of studied biochemical parameters are presented in Table-II.

**Table II:** Mean ± SE Serum Biochemical Values in Control and Acquired Heart Disease Cases

| Serum Biochemistry | Group – I Control (n=20) | Group – II Dilated Cardiomyopathy (n=58) | Group – III Mitral Valve Disease (n=39) | Group – IV Pericardial Effusion (n=6) | Group – V Hypertrophic Cardiomyopathy (n=3) | F Value |
|---|---|---|---|---|---|---|
| BUN (mg/dl) | 20.03±1.65 | 19.86±1.07 | 20.72±2.99 | 18.34±2.92 | 20.69±6.68 | $0.060^{NS}$ |
| Creatinine (mg/dl) | 1.46±0.15 | 1.08±0.06 | 1.36±0.32 | 1.09±0.17 | 1.03±0.25 | $0.438^{NS}$ |
| ALT (IU/dl) | 49.86±15.92 | 60.70±3.75 | 59.03±4.78 | 105.00±62.38 | 56.50±35.50 | $1.589^{NS}$ |
| ALP (IU/dl) | 171.89±29.99 | 121.04±13.35 | 136.50±30.55 | 160.33±40.50 | 347.00±231.13 | $1.930^{NS}$ |
| TP (g/dl) | 6.14±0.24 | 6.42±0.12 | 6.55±0.14 | 6.56±0.31 | 6.25±0.60 | $0.505^{NS}$ |
| Albumin (g/dl) | 2.49±0.07 | 2.66±0.07 | 2.74±0.07 | 2.36±0.24 | 2.36±0.65 | $1.407^{NS}$ |
| Calcium (mmol/dl) | 9.92±0.35 | 10.25±0.15 | 9.71±0.22 | 8.98±0.89 | 10.56±1.76 | $1.970^{NS}$ |
| Phosphorous (mmol/dl) | 5.34±0.59 | 4.24±0.21 | 4.25±0.24 | 3.37±0.31 | 4.46±1.86 | $1.478^{NS}$ |
| Sodium (mmol/dl) | $148.78±4.19^a$ | $157.93±1.52^b$ | $162.13±1.47^b$ | $157.00±5.05^b$ | $145.67±0.67^a$ | $4.190^{**}$ |
| Potassium (mmol/dl) | 4.70±0.09 | 4.81±0.04 | 4.78±0.04 | 4.76±0.12 | 5.03±0.11 | $0.815^{NS}$ |

Same superscript in row do not differ significantly
NS Not significant ($P$>0.05)
* Significant ($P$< 0.05)
**Highly Significant ($P$<0.01)

In the current study serum biochemical examination showed no significant changes in dogs with AHDs except sodium. A highly significant increase in Sodium values were observed in the present study in all groups except HCM. Andreoli, (1999) [1] reported renal retention of sodium in heart failure were the major reason for water retention. This concurs with the above findings.

## Conclusion

Haematological assessment showed no significant changes. Serum biochemical assessment showed a significant hypernatremia in all groups except HCM. Otherwise no significant changes in the routinely assessed biochemical parameters in dogs with AHDs.

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