

## HAEMATOBIOCHEMICAL ALTERATION IN HYPOTHYROID DOGS

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The present study was carried out to study the haemato-biochemical alteration in twenty five hypothyroid dogs. Clinical cases were initially suspected based on classical clinical signs and confirmed by thyroid profile (low T<sub>4</sub> and T<sub>3</sub>) evaluated by CLIA method. In biochemical study, the most significant alteration was increased level of serum cholesterol and triglyceride. Additionally, there was increase in the value of ALP and Total and direct bilirubin. Three dogs showed diabetes mellitus in coexistence with hypothyroidism. Some dogs showed decrease level of calcium whereas some dogs showed increase level of phosphorus.

**Keywords:** Biochemical study, Dog, Haematology, Hypothyroidism, T<sub>3</sub>, T<sub>4</sub> and TSH.

Hypothyroidism is a thyroid disorders commonly seen in dogs and occurs due to decreased secretion of thyroid hormones (T<sub>4</sub> and T<sub>3</sub>) by thyroid gland. The most common cause for decreased secretion of hormone is inflammation or thyroid gland. Among the dogs, hypothyroidism is commonly seen in medium to large-sized dogs, with some being more predisposed than others and the susceptible breeds include Dobermanpinschers, Irish-setters, Golden-retrievers, Greatdanes, Olden-glishtsheep dogs, Dachshunds, Miniatur-eschnauzers, Boxers, Poodles and Cockerspaniels. Hypothyroidism is frequently encountered in 4-10 years age and neutered male and spayed female dogs (Feldman and Nelson, 2004). Hypothyroidism in the dog is classified as primary, secondary and tertiary depending upon whether the cause resides in the thyroid gland, pituitary gland or hypothalamus, respectively. Although dysfunction anywhere in the hypothalamic-pituitary-thyroid axis may result in thyroid hormone deficiency, more than 95% of clinical cases of hypothyroidism in dogs appeared to result from destruction of the thyroid gland itself (primary hypothyroidism). The secondary hypothyroidism occurs due to destruction of pituitary thyrotrophs by an expanding, space-

occupying tumor (Peterson *et al.*, 2013). Tertiary hypothyroidism although rare, occurs due to decreased secretion of Thyroid Releasing Hormone (TRH) from hypothalamus (Feldman and Nelson, 2004). Clinically hypothyroidism is characterized by lethargy, obesity, exercise intolerance, poor wound healing, and dermatological abnormalities including alopecia, poor skin and hair coat, loss of hairs, or abnormal hair turnover, dull or brittle hair, altered pigmentation, oily or dry skin and thickened skin and polyneuropathy (Suraniti *et al.*, 2008). Although, the clinical sign in hypothyroid dogs has been reported by many workers as (Kour *et al.*, 2021). But haematobiochemical studies in hypothyroidism in canines are scanty. Present study conducted for Haemato-biochemical alteration in hypothyroid dogs.

### Materials and Methods

This study was planned to know the haematobiochemical alteration in dogs affected with hypothyroidism. The work was carried out at the Department of Veterinary Pathology, Veterinary College, Mumbai, The study was conducted over a period of four months *i.e.* between February to May 2015.

Total of twenty five cases were considered for this study based on the clinical signs and serum hormone profile. The blood samples from twenty five dogs suspected for hypothyroidism were collected in EDTA vials for hematological profile and in a clean test tube without anticoagulant for biochemical and hormonal assay. Haematological parameters *viz.*, Hemoglobin, Packed Cell Volume, Total Erythrocyte Count Total Leukocyte Count, Platelet count, Mean corpuscular volume, Mean corpuscular Hemoglobin, Mean Corpuscular Hemoglobin Concentration were estimated with the help of automatic cell counter. The Differential Leucocyte Count were counted manually and interpreted. The serum was separated after keeping the tube in slanting position for half to one hour for estimation of serum biochemical and hormones profile. The samples were analyzed for total protein,

serum albumin, cholesterol, Serum triglycerides, Alanine aminotransferase, Aspartate aminotransferase, Alkaline phosphatase, Creatinine, Blood Urea Nitrogen, Total and Direct bilirubin, Serum glucose, Serum Calcium and Phosphorus. These parameters were estimated by using semi-automatic biochemical analyzer, using commercial reagent .

Hypothyroidism was diagnosed by quantitative measurement of triiodothyronine, thyroxine and thyroid stimulating hormone in the serum of each blood samples of a dog by Electrochemiluminescence immunoassay, Estimation of serum insulin was carried out by using CLIA technique. The observations of mean  $\pm$  S.E. values of Hb, PCV, TEC, MCV, MCH, MCHC, TLC, neutrophils, lymphocytes, eosinophils, basophils and platelets of hypothyroid dogs are given in Table-1.

**Table 1: Mean and range value of Hematological Parameters in hypothyroid dogs**

Parameter	Mean $\pm$ S.E	Range
Hb (g/dl)	14.28 $\pm$ 0.36	8.7-17.3
TEC (10 <sup>6</sup> /cumm )	6.52 $\pm$ 0.15	4.24-7.61
PCV ( %)	46.58 $\pm$ 0.92	29-51.1
MCV ( fl )	69.65 $\pm$ 0.55	63.7-73.4
MCH (pg )	23.18 $\pm$ 0.34	19.2-24.6
MCHC (g/dl )	32.27 $\pm$ 0.54	29-43
TLC ( 10 <sup>3</sup> / cumm)	14.18 $\pm$ 0.12	8.3-35.6
Neutrophils (%)	76.04 $\pm$ 0.9	70-90
Lymphocytes (%)	21.68 $\pm$ 0.87	9-26
Monocytes (%)	1.56 $\pm$ 0.20	0-3
Eosinophils (%)	0.64 $\pm$ 0.12	0-2
Basophils (%)	0.08 $\pm$ 0.05	0-1
Platelets (10 <sup>3</sup> / cumm )	2.04 $\pm$ 0.16	0.48-4.32

## Results and Discussion

In the present study, out of 25 clinical cases, four dogs (16%) showed reduction in the value TEC (<6 mil/cmm) and normocytic and normochromic, non-regenerative anaemia in dogs. Leukogram study revealed increase in the values of TLC (Leucocytosis) in three dogs (12%). Thrombocytopenia was observed ten dogs (40%). The observations recorded in the present investigation are in accordance with the reports of Kaur *et al.*, (2021). Hypothermia reduces platelet function, resulti

-ng in hepatic platelet sequestration and decreased enzymatic activity within the coagulation cascade particular Factor VIII and VIII Ag as also reported by Henik and Dixon (2000).

### **Serum biochemical alterations:**

The observations of mean  $\pm$  S.E values of liver function tests *viz.* serum Aspartate aminotransferase (AST), Alanine aminotransferase (ALT), Alkaline phosphatase (ALP), total protein, albumin, globulin and Bilirubin (total, direct and indirect) and kidney function

test such as Urea, Creatinine and BUN in hypothyroid dogs are given in Table-2. Out of 25 clinical cases of hypothyroidism, elevated serum levels of ALP was noticed in 13 cases (52%) which is in accordance with the observations of Kour *et al.*, (2021) who reported elevated liver enzyme like ALP. However, in the present study, AST and ALT level were within the normal physiological range.as also mentioned by Muller *et al.*, 2001) that the elevated liver enzyme in hypothyroidism occurs possibly due to myopathy and

degenerative hepatopathy due to infiltration of fat. Among 25 cases, elevated serum levels of Total Bilirubin and Direct Bilirubin was noticed in 22 cases (88%). Similarly, Dixon *et al.*, (1999), during investigation of biochemical alteration in 50 hypothyroid dog reported increased concentrations of ALP (21% of case), AST (15%) and Total bilirubin (60%). Hypothyroidism resulted in an enhanced hepatic bilirubin UDP-glucuronosyltransferase activity and in a decreased p-nitrophenoltransferase activity.

**Table 2: Mean and range value of serum biochemical parameters in hypothyroid dogs**

Parameter	Mean ± S.E. (Range)	Range
ALT (u/L)	59.2±5.07	14-104
AST (u/L)	39.24±2.38	14-73
ALP (u/L)	155.76±14.37	14-280
Total protein (gm/dl)	6.87±0.11	6.0-8.0
Albumin (gm/dl)	3.41±0.08	2.50-4.0
Globulin (gm/dl)	3.48±0.12	2.5-5.06
Total Bilirubin (mg/dl)	1.05±0.08	0.2-1.8
Direct Bilirubin (mg/dl)	0.70±0.05	0.1-1.4
Indirect Bilirubin (mg/dl)	0.35±0.04	0.1-0.8
Urea (mg/dl)	52.31±3.2	20-78
Creatinine (mg/dl)	1.064±0.03	0.6-1.52
BUN (mg/dl)	24.22±1.30	12.1-34.57

The observations of mean ± S.E. values of cholesterol and triglycerides of hypothyroid dogs are given in Table-3. In the present study, out of 25 clinical cases, 15 cases (60%) showed increase in the values of cholesterol while the serum triglycerides were increased in 16 cases (64%). These findings are in accordance with the reports of Mazaki *et al.*(2015) and Kour *et al.* (2021). In hypothyroidism, decreased thyroid function is accompanied by reduced activity of HMG-CoA reductase (3-hydroxy-3-methylglutaryl-coenzyme A). This

is due to the decreased LDL-receptors activity, resulting in decreased catabolism of LDL (low density lipoprotein) and IDL (Intermediate-density lipoproteins). Moreover, a decrease in LPL (lipoprotein lipase) activity is found in hypothyroidism, decreasing the clearance of Triglycerides-rich lipoproteins. Therefore, overt hypothyroid patients may also present with elevated triglycerides levels associated with increased levels of VLDL (very low density lipoprotein cholesterol) as also mentioned by Rizos *et al.*, (2011).

**Table 3: Mean and range value of serum biochemical parameters in hypothyroid dogs**

Parameters	Mean ± S.E. (Range)	Range
Cholesterol (mg/dl)	316.48± 15.96	170-426
Triglycerides (mg/dl)	173.6± 14.71	78-337
Glucose (mg/dl)	106.6± 6.19	70-180
Insulin (uU/ml)	28.56± 0.79	13-32
Calcium (mg/dl)	9.27± 0.26	7-10.7
Phosphorus (mg/dl)	4.78± 0.26 ( )	2-6.7

### ***Alterations in insulin and glucose:***

The observations of mean  $\pm$  S.E values of glucose and insulin were given in Table-3. In this study 3 cases were found with diabetes mellitus. The levels of serum glucose in hypothyroid dogs with diabetes mellitus was 163.33 $\pm$ 16.68 mg/dl. Elevated level of serum glucose in hypothyroid dogs was also mentioned by Kour *et al.* (2021).

### ***Alterations in serum calcium and phosphorus***

The observations of mean  $\pm$  S.E values of calcium and phosphorus were given in Table-3. Out of 25 cases, seven dogs (28%) showed decrease level of serum calcium whereas increase level of phosphorus was observed in three dogs (12%). These findings are in accordance with the reports of Yousif *et al.* (2012) who noticed hypocalcaemia in three groups of induced Hypothyroidism.

### ***Serum thyroid hormonal alteration***

On the basis of CLIA result, serum estimation of thyroid hormone i.e. Total T<sub>3</sub> and Total T<sub>4</sub> showed lower values than the normal in twenty five dogs. Thus, on the basis of low serum levels of T<sub>3</sub> and T<sub>4</sub>, a total of twenty five dogs were diagnosed with hypothyroidism. All the twenty five dog investigated had T<sub>3</sub> and T<sub>4</sub> levels less than the normal range with range of 0.3388 to 0.847 and 3.86 to 16.98 nmol/L for T<sub>3</sub> and T<sub>4</sub>, respectively. Serum values of TSH did not show any conclusive results for all the twenty five canine hypothyroid cases.

It was concluded, Haematological study showed normocytic normochromic, non-regenerative anemia with leukocytosis Biochemical studies ncrease in the value of ALP and total and direct bilirubin, hyperchol-esterolemia and hypertriglyceridemia, hypocacemia and hyperglycemia

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