Original Research Article

The Study of Various Haematological and Biochemical Parameters in Pre and Post Treated Dogs Affected With Demodectic Mange

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A B S T R A C T

Keywords

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The study of biochemical parameters was performed on 24 dogs selected for study that included 6 healthy dogs and 18 dogs affected with demodectic mange. A single time blood sample was collected from cephalic or recurrent tarsal vein of 6 healthy dogs while at interval of 0 day, 7th day, 14th day, 21st day and 28th day of study from 18 dogs affected with demodectic mange divided in three treatment groups (Gr. A, B and C). The biochemical parameters included in this study were estimation of total protein, random blood glucose, total serum cholesterol, serum glutamate pyruvate transaminase (SGPT)/alanine transaminase (ALT), serum glutamic-oxaloacetic transaminase (SGOT)/aspartate aminotransferase (AST) and serum alkaline phosphatase. Estimation of Haemoglobin (Hb), Packed cell volume (PCV), Erythrocyte sedimentation rate (ESR), Total Erythrocyte count (TEC), Total Leucocyte count (TLC), Differential Leucocyte count (DLC): Lymphocyte, Neutrophil, Monocyte, Eosinophil and Basophil. The mean value of haemoglobin, PCV (%), TEC (10^6/cmm), and ESR (mm/hrs), of affected (Pre-treatment) group of dogs decreased significantly ($P<0.05$) as compared to the healthy control groups of the dogs. The mean value of TLC (10^3/cmm) of affected (Pre-treatment) group of dogs increased significantly ($P<0.05$) as compared to the healthy control groups of the dogs with neutrophilia, lymphopenoea, eosinophilia, non-significant monocytopenoea, and basophilia. A significant decrease ($P<0.05$) in blood glucose and serum albumin level and non- significant decrease in total serum protein were observed. A significant increase ($P<0.05$) in SGPT (ALT), SGOT (AST), serum alkaline phosphatase (ALP) and non-significant increase in total cholesterol in affected (Pre-treatment) group of dogs were observed as compared to the healthy control groups of the dogs.

Introduction

Canine demodicosis is a common parasitic infection now a day prevalent in and around Patna .Huge population of canines regularly appearing in clinics with various dermatological disorders .The common dermatological problems came in notice with pruritis, itching, alopecia, crusting, scaling, otitis, pustules, non-healing wounds, nodules, tumours and ulcerative disorders . Out of which many of them were found affected with demodectic mange infection . Very limited options of the treatments of the mites are available .Various cases has been detected which found resistant to conventional allopathic drugs .Relapses were also noticed with severe skin problem after successful allopathic drugs therapy of *demodex canis.*

Materials and Methods

For haematological, study of Demodectic mange a total of 18 infected dogs as well as 06 healthy dogs were selected. For the haematological examination blood was collected in the dried vials containing EDTA as an anticoagulant at 1 mg/ml. Three ml of blood was collected in a vial containing sodium fluoride as anticoagulant for blood glucose estimation. The haematological parameters were studied by dividing all 18 demodex infected dogs into three groups at 0 day (Pre-treatment) and at weekly interval for a period of four weeks by routine methods on each sampling time. The haematological parameters studied in this study included Hb, PCV, ESR, TEC, TLC and DLC.

For serum biochemical examination the blood samples were collected in sterilized dry test tubes without anticoagulant .The separation of serum from blood samples were performed by centrifugation at 3000

rpm to separate the blood corpuscles and serum was transferred in to glass vials using Pasture pipette and preserved in deep freeze for further biochemical estimations .The enzyme estimations were done within 12 hours of the collection of serum samples. The biochemical parameters studied in this study included Total serum Protein, Blood glucose, Total Serum Cholesterol, SGPT/ALT, SGOT/ AST and Serum Alkaline Phosphatase.

The findings of the study were analysed by standard statistical methods –One Way ANOVA.

Results and Discussion

Haematology

The haematological parameters included in this studies were estimation of Hb%, PCV%, ESR, TEC), TLC) and DLC% including lymphocyte, neutrophil, monocyte, eosinophil and basophil.

The result of this study indicates that the values of 28th day's treatment were appeared almost nearer to the healthy control groups in all treatments groups A, B and C. It was also observed during experiments that the affected animals were appeared almost physically nearer to the healthy control group animals. Hence, the values of 28th day's treatment were selected to compare among all the groups of experiments (Table 5).

Haemoglobin (Hb%)

The mean value of haemoglobin were recorded as 13.058 ± 0.234, 11.925 ± 0.438, 12.375 ± 0.201 in treatment Gr. A, treatment Gr. B and treatment Gr. C, respectively. Mean value of Hb in pre-treatment group (8.302 ± 0.462) was found significant

decrease as compared to the healthy control (12.958 ± 0.325) and from treatment group Gr. A, B and C, however, non-significant difference was observed between treatment group Gr. A, B and C adn healthy control group (Table 1).

Pack cell volume (PCV%)

The mean value of PCV was recorded as 39.175 ± 1.704, 35.775 ± 1.315 and 37.125 ± 0.604 in treatment Gr. A, treatment Gr. B and treatment Gr. C, respectively. The mean value of PCV in pre treatment group (24.897 ± 1.385) significantly decreased from healthy control group (38.875 ± 0.976) and treatment group Gr. A, B and C, however, non-significant difference was observed among treatment group Gr. A, B and C and healthy control group (Table 1).

Erythrocyte sedimentation rate (ESR mm/hrs.)

The mean values of ESR were recorded as 5.7 ± 0.45, 6.89 ± 0.69 and 6.2 ± 0.2 in treatment Gr. A, treatment Gr. B and treatment Gr. C, respectively. Significant increase in mean value of ESR in pre treatment group (7.12 ± 0.71) as compared to healthy control (6.0 ± 0.57) and treatment group Gr. A, B and C however, non-significant difference was observed among treatment group Gr. A, B and C and healthy control group (Table 2).

Total erythrocyte count (TEC)

The mean values of TEC were recorded as 5.945± 0.181, 5.409± 0.211 and 5.674± 0.311 in treatment Gr. A, treatment Gr. B and treatment Gr. C, respectively. The mean value of TEC in pre treatment group (3.530± 0.160) decreased significantly from healthy control group (6.516± 0.260) and treatment group Gr. A, B and C however, non-

significant difference was observed among treatment group Gr. A, B and C and healthy control group (Table 2).

Total leucocytes count (TLC)

The mean values of TLC were recorded as 7.67 ± 0.196, 9.69 ± 0.66 and 8.29± 0.44 in treatment Gr. A, treatment Gr. B and treatment Gr. C, respectively. The mean value of TLC in pre treatment group (12.45 ± 0.02) was significantly increased significantly from healthy control group (7.163 ± 0.330) and treatment group Gr. A, B and C however, non-significant difference was observed treatment group Gr. A, B and C and healthy control group (Table 3).

Differential Leucocyte count (DLC)

Neutrophil (%)

The mean values of neutrophil % were recorded as 65.5± 0.846, 68.166± 1.249 and 66.166± 0.945 in treatment Gr. A, treatment Gr. B and treatment Gr. C, respectively. The mean value of neutrophil (%) in pre-treatment group there was significant increase in the mean value of neutrophil (%) in pre- treatment group (73.944± 0.612) as compared to healthy control group (63.666± 0.881) and treatment group Gr. A, B and C. However, non-significant difference was observed among treatment group Gr. A and Gr. C and healthy control group (Table 3).

Lymphocyte (%)

The mean values of lymphocyte % % were recorded as 24.833± 0.703, 22.666± 0.494 and 23.666± 0.760 in treatment Gr. A, treatment Gr. B and treatment Gr. C, respectively. The mean value of lymphocyte % in pre treatment group (15.555± 0.543) decreased significantly as compared to healthy control group (25.833± 1.194) and

treatment group Gr. A, and C however, non-significant difference was observed among treatment group Gr. C and healthy control group as well as among pre treatment group and Gr. C.

A non-significant difference was noted between treatment group B and pre treatment affected group and the mean value of treatment group B significantly different from from healthy control group (Table 3).

Monocyte (%)

The mean value of monocyte (%) in healthy control (Gr. D) was recorded as 5.166± 0.600, while 4.944± 0.337 in pre-treatment group (0 day). The mean values of monocyte (%) were recorded as 4.541± 0.135, 4.625± 0.507 and 4.458± 0.312 in treatment Gr. A, treatment Gr. B and treatment Gr. C, respectively. The mean value of monocyte % among all heathy control, pre treatment group and treatment group Gr. A, B and C differ non significantly from each other (Table 4).

Eosinophil (%)

The mean values of eosinophil (%) were recorded as 4.375± 0.314, 5.333± 0.314 and 4.625± 0.154 in treatment Gr. A, treatment Gr. B and treatment Gr. C, respectively. Significant increase was noted in the mean value of eosinophil % in pre treatment group (8.166± 0.398) as compared to healthy control (5.333± 0.557) and treatment group Gr. A, B and C however, non-significant difference was observed among the treatment group Gr. A, B and C and healthy control group (Table 4).

Basophil (%)

The mean value of basophil (%) in healthy control (Gr. D) was recorded as 0.166±

0.166, while 0.222± 0.129 in pre-treatment group (0 day). The mean values of basophil (%) were recorded as 0.333± 0.333, 0.5± 0.5 and 0.166± 0.166 in treatment Gr. A, treatment Gr. B and treatment Gr. C, respectively. The mean value of basophil (%) among all healthy control, pre treatment group and treatment group Gr. A, B and C differ non significantly from each other (Table 4).

The mean value of haematological profile of healthy control group were more over similar to all treatment groups, however a significant difference was observed from pre treatment group. The mean values of Hb, PCV and TEC were significantly lower ($P<0.01$) in dogs suffering from demodectic mange as compared to control group indicating macrocytic anaemia in affected groups.

This anaemia could be due to the stress arising from the disease. Similar findings were reported by Gupta and Prasad (2001) and Soodan *et al.,* (2005). Generally the demodectic dogs in general had significantly higher ($P<0.01$) TLC, neutrophils and eosinophilic count than healthy control. Leukocytosis along with neutrophilia and eosinophilia concurred with the findings of Sharma *et al.,* (2005).

The generalized inflammation and response of leucocytes to prolonged antigenic stimulus in the form of chronic demodex mite infection may be responsible for leukocytosis. Esinophilia may be a reflection of hypersensitivity to persistent demodex mites in tissues. Lymphopenia in affected animals during present study simulated the findings of Dhume *et al.,* (2002) and Nair and Nauriyal, (2007). Lymphopenia might be due to the reason that cell mediated immunity plays important role in fighting against demodectic mites.

Table.1 Mean±S.E. of Hb (gm %), and PCV (%) among various groups of dogs

	Mean±S.E. of Hb (gm %)		**Mean±S.E. of PCV (%)**	
Sl. No.	**Group**	**Mean±S.E.**	**Group**	**Mean±S.E.**
1.	Healthy control (Gr. D)	12.958 [a] ± 0.325	Healthy control (Gr.D)	38.875 [a] ± 0.976
2.	Affected (Pre-Treatment)	8.302 [b] ± 0.462	Affected (Pre-Treatment)	24.897 [b] ± 1.385
3.	Gr. A	13.058 [a] ± 0.234	Gr. A	39.175 [a] ± 1.704
4.	Gr. B	11.925 [a] ± 0.438	Gr. B	35.775 [a] ± 1.315
5.	Gr. C	12.375 [a] ± 0.201	Gr. C	37.125 [a] ± 0.604

* Mean (column wise) with different superscripts differ significantly (P<0.01)

Table.2 Mean±S.E. of ESR (mm/hrs) ,TEC (10^6/cmm) among various groups of dogs

Mean±S.E. of ESR (mm/hrs)		**Mean±S.E. of TEC (10^6/cmm)**	
Group	**Mean±S.E.**	**Group**	**Mean±S.E.**
Healthy control (Gr. D)	6.0 [a] ± 0.57	Healthy control (Gr. D)	6.516 [a] ± 0.260
Affected (Pre-Treatment)	7.1 [b]2±0.71	Affected (Pre-Treatment)	3.530 [b] ± 0.160
Gr. A	5.7 [a] ± 0.45	Gr. A	5.945 [a] ± 0.181
Gr. B	6.89 [a]±0.89	Gr. B	5.409 [a] ± 0.211
Gr. C	6.2 [a]±0.2	Gr. C	5.674 [a] ± 0.311

* Mean (column wise) with different superscripts differ significantly (P<0.01)

Table.3 Mean±S.E. of Neutrophil (%), TLC (10^3/cmm), Lymphocyte (%) among various groups of dogs

	Mean±S.E. of Neutrophil (%)		**Mean±S.E. of TLC(10^3/cmm)**		**Mean±S.E. of Lymphocyte(%)**	
Sl. No.	**Group**	**Mean±S.E.**	**Group**	**Mean±S.E.**	**Group**	**Mean±S.E.**
1.	Healthy control (Gr. D)	63.666 [bd] ± 0.881	Healthy control (Gr. D)	7.163 [b] ± 0.33	Healthy control (Gr. D)	25.833 [ad] ± 1.194
2.	Affected (Pre-Treatment)	73.944 [a] ± 0.612	Affected (Pre-Treatment)	12.45 [a] ± 0.02	Affected (Pre-Treatment)	15.555 [bd] ± 0.543
3.	Gr. A	65.5 [bd] ± 0.846	Gr. A	7.67 [b] ± 0.196	Gr. A	24.833 [ac] ± 0.703
4.	Gr. B	68.166 [bc] ± 1.249	Gr. B	9.69 [b] ± 0.66	Gr. B	22.666 [bd] ± 0.494
5.	Gr. C	66.166 [bd] ± 0.945	Gr. C	8.29 [b] ± 0.44	Gr. C	23.666 [ad] ± 0.760

* Mean (column wise) with different superscripts differ significantly (P<0.01)

Table.4 Mean±S.E. of Monocyte (%), Eosinophil (%), Basophil (%) among various groups of dogs

	Mean±S.E. of Monocyte (%),		Mean±S.E. of Eosinophil(%)		Mean±S.E. of Eosinophil(%)	
Sl. No.	Group	Mean±S.E.	Group	Mean±S.E.	Group	Mean±S.E.
1.	Healthy control (Gr. D)	5.166[a] ± 0.600	Healthy control (Gr. D)	5.333[b] ± 0.557	Healthy control (Gr. D)	0.166[a] ± 0.166
2.	Affected (Pre-Treatment)	4.944[a] ± 0.337	Affected (Pre-Treatment)	8.166[a] ± 0.398	Affected (Pre-Treatment)	0.222[a] ± 0.129
3.	Gr. A	4.541[a] ± 0.135	Gr. A	4.375[b] ± 0.314	Gr. A	0.333[a] ± 0.333
4.	Gr. B	4.625[a] ± 0.507	Gr. B	5.333[b] ± 0.314	Gr. B	0.5[a] ± 0.5
5.	Gr. C	4.458[a] ± 0.312	Gr. C	4.625[b] ± 0.154	Gr. C	0.166[a] ± 0.166

* Mean (column wise) with different superscripts differ significantly (P<0.01)

Table.5 The mean values of biochemical parameters in different groups of dogs before and after treatment

Parameters	Healthy Control (n=6)	Pre treatment (n=18)	Gr.-A			28th day	Gr.-B			28th day	Gr.-C			28th day
Albumin g/dl	3.130± 0.067	2.048±0.091	1.895± 0.081	2.246± 0.065	2.586± 0.054	2.925± 0.113	2.193± 0.200	2.320± 0.183	2.521± 0.152	2.743± 0.153	2.056± 0.172	2.331± 0.128	2.790± 0.062	3.041± 0.076
ALP IU/L	49.333± 2.917	58.055± 1.422	57.666± 2.060	56.000± 2.097	53.500± 2.262	51.833± 2.072	62.166±2.227	60.166± 2.166	57.833± 2.271	56.166± 2.358	54.333± 2.290	53.666± 2.092	53.500± 2.262	53.000± 2.265
ALT/SGPT IU/L	18.608± 0.589	21.262± 0.428	21.108± 1.062	20.201± 0.924	19.545± 0.692	19.508± 0.653	21.515± 0.360	21.298± 0.347	21.035± 0.331	20.830± 0.340	20.653± 0.602	20.513± 0.600	20.435± 0.629	20.293± 0.671
AST/SGOT IU/L	29.801± 0.755	36.168± 0.628	33.828± 0.746	33.363± 0.628	32.875± 0.492	31.546± 0.410	35.911± 1.250	35.251± 1.106	34.583± 1.049	34.136± 1.006	36.706± 0.878	35.676± 0.689	34.545± 0.584	33.576± 0.551
Cholesterol Mg/dl	139.666± 3.870	148.005± 3.682	147.33± 5.565	146.00± 4.993	144.00± 5.131	140.50± 4.417	145.50± 5.371	144.66± 5.213	144.16± 5.558	144.50± 5.395	144.66± 7.111	143.50± 6.458	142.66± 6.075	142.00± 5.842
Glucose Mg/dl	95.666± 2.108	72.222± 1.083	76.500± 2.171	80.500± 2.232	85.166± 3.059	88.000± 3.172	73.333± 1.943	76.500± 2.232	78.833± 2.257	81.166± 1.973	75.833± 1.194	79.333± 1.584	82.833± 1.777	58.000± 1.983
Total protein g/dl	6.481± 0.272	6.021± 0.080	6.060± 0.122	6.125± 0.135	6.240± 0.138	6.385± 0.177	5.891± 0.117	5.965± 0.112	6.065± 0.099	6.115± 0.107	6.193± 0.157	6.238± 0.151	6.180± 0.114	6.295± 0.175

* Mean (row wise)

Table.6 Mean±S.E. of Blood Glucose (mg/dl), Total Protein (g/dl) Serum Albumin (g/dl), among various groups of dogs

Sl. No.	Blood Glucose (mg/dl)		Total Protein (g/dl)		Serum Albumin (g/dl)	
	Group	Mean±S.E.	Group	Mean±S.E.	Group	Mean±S.E.
1.	Healthy control (Gr. D)	95.666 [a] ± 2.108	Healthy control (Gr. D)	6.481 ± 0.272	Healthy control (Gr. D)	3.13 [a] ± 0.067
2.	Affected (Pre-Treatment)	72.222 [bd] ± 1.083	Affected (Pre-Treatment)	6.021 ± 0.080	Affected (Pre-Treatment)	2.048 [bde] ± 0.091
3.	Gr. A	88 [bc] ± 3.172	Gr. A	6.385 ± 0.177	Gr. A	2.925 [bce] ± 0.113
4.	Gr. B	81.166 [bc] ± 1.973	Gr. B	6.115 ± 0.107	Gr. B	2.743 [bde] ± 0.153
5.	Gr. C	85 [bc] ± 1.983	Gr. C	6.295 ± 0.175	Gr. C	3.041 [bce] ± 0.076

* Mean (column wise) with different superscripts differ significantly (P<0.01)

Table.7 Mean±S.E. of Total Cholesterol (mg/dl), SGPT (ALT) (IU/L), SGOT (AST) (IU/L) , Serum Alkaline Phosphatase (ALP) (IU/L) among various groups of dogs

Sl. No.	Cholesterol (mg/dl)		SGPT (ALT) (IU/L)		SGOT (AST) (IU/L)		Serum Alkaline Phosphatase (ALP) (IU/L)	
	Group	Mean±S.E.	Group	Mean±S.E.	Group	Mean±S.E.	Group	Mean±S.E.
,1.	Healthy control (Gr. D)	139.666 ± 3.870	Healthy control (Gr. D)	18.608 [b] ± 0.589	Healthy control (Gr. D)	29.801 [bc] ± 0.755	Healthy control (Gr. D)	49.333 [b] ± 2.917
2.	Affected (Pre-Treatment)	148.005 ± 3.682	Affected (Pre-Treatment)	21.262 [a] ± 0.428	Affected (Pre-Treatment)	36.168 [a] ± 0.628	Affected (Pre-Treatment)	58.055 [a] ± 1.422
3.	Gr. A	140.5 ± 4.417	Gr. A	19.508 [a] ± 0.653	Gr. A	31.546 [bc] ± 0.410	Gr. A	51.833 [a] ± 2.072
4.	Gr. B	144.5 ± 5.395	Gr. B	20.83 [a] ± 0.340	Gr. B	34.136 [ac] ± 1.006	Gr. B	56.166 [a] ± 2.358
5.	Gr. C	142 ± 5.842	Gr. C	20.293 [a] ± 0.671	Gr. C	33.576 [ac] ± 0.551	Gr. C	53 [a] ± 2.265

* Mean (column wise) with different superscripts (P<0.01)

Biochemical parameters

The biochemical parameters included in this study were estimation of total protein, random blood glucose, total serum cholesterol, SGPT/ALT, SGOT/AST and serum alkaline phosphatase.

The result of this study indicates that the values of 28th day's treatment appeared almost nearer to the healthy normal groups in all treatments groups. It was also observed during experiments that the affected animals appeared almost nearer to healthy animals physically. Hence, the values of 28th day's treatment were selected to compare among all the groups of experiments (Table 5).

Glucose (mg/dl)

The mean values of glucose were recorded as 88± 3.172, 81.166± 1.973 and 85± 1.983 in treatment Gr. A, treatment Gr. B and treatment Gr. C, respectively. The mean value of glucose in pre treatment group (72.222± 1.083) decreased significantly as compare to the healthy control (95.666± 2.108) and treatment group Gr. A, B and C however, non-significant difference was observed among treatment group Gr. A, B and C. The mean value of treatment group A, B and C were significantly differ from healthy control group and pre-treatment affected group of dogs (Table 6).

Total protein (g/dl)

The mean value of total protein (g/dl) in healthy control (Gr. D) was recorded as 6.481± 0.272, while 6.021± 0.080 in pre-treatment group (0 day). The mean values of total protein were recorded as 6.385± 0.177, 6.115± 0.107 and 6.295± 0.175 in treatment Gr. A, treatment Gr. B and treatment Gr. C, respectively. There were non-significant

difference was observed among pretreatment affected group, treatment group A, B, C and the healthy control groups of the dogs (Table 6).

Albumin (g/dl)

The mean values of albumin were recorded as 2.925± 0.113, 2.743± 0.153 and 3.041± 0.076 in treatment Gr. A, treatment Gr. B and treatment Gr. C, respectively. The mean value of albumin in pre treatment group (2.048± 0.091) decreased significantly as compared to healthy control group (3.13± 0.067) and treatment group Gr. A, B and C. However, the mean value of treatment group A differ significantly from healthy control and treatment group B. The mean value of treatment group B differ significantly from healthy control group, treatment group A and C but a similar to the pre treated affected group of dogs, because non-significant difference was noted among treatment group B and pre treatmnet group of dogs, The difference in mean value of treatment group C and A was non-significant (Table 6).

The mean blood glucose levels in affected animals was significantly lower (P<0.01) than that of healthy control, indicating hypoglycaemia in them which might be due to increased need of glucose during inflammatory reactions as suggested by Sharma (2006) and Gupta (2008). A non-significant decrease (P< 0.01) in mean total protein levels in demodectic mange affected dogs as compared to the healthy control group indicating hypoproteinaemia which was in agreement with the observations of Biswas *et al.,* (2002) and Solanki *et al.,*(2007).The mean value of plasma albumin revealed a significant decrease(P< 0.01) in pre-treatment group indicating hypoalbuminemia. Decreased levels of plasma albumin in the present study might

be due to excessive breakdown of proteins caused by trauma to the skin and proliferation of mites.

Cholesterol (mg/dl)

The mean value of cholesterol (mg/dl) in healthy control (Gr. D) was recorded as 139.666± 3.870, while 148.005± 3.682 in pre-treatment group (0 day). The mean values of cholesterol were recorded as 140.5± 4.417, 144.5± 5.395, 142±5.842 in treatment Gr. A, treatment Gr. B and treatment Gr. C, respectively. Non-significant increase was observed among all the observations as compared to the healthy control group. After treatment the mean value of cholesterol decreased but the difference was non-significant among treatment group A, B, C, pre treatment and healthy control group (Table 7).

Alanine aminotransferase (ALT/SGPT IU/L)

The mean value of ALT in pre treatment group (21.262± 0.428) and treatment group Gr. A, B and C (19.508± 0.653, 20.83± 0.340 and 20.293± 0.671) respectively, found to be significant increased as compared to healthy control group (18.608± 0.589) however, non-significant difference was observed among pretreatment control and treatment group Gr. A, B and C (Table 7).

Aspartate aminotransferase (AST/SGOT IU/L)

The mean value of AST in pre treatment group (36.168± 0.628) increased significantly as compare to healthy control group (29.801± 0.755) and treatment group Gr. A (31.546± 0.410), however, no significance difference was observed as compared to treatment group Gr. B (34.136±

1.006) and group C (33.576± 0.551). Treatment Gr. A decreased significantly from treatment Gr. B while, non-significant difference was observed from treatment Gr. B and Gr. C (Table 7).

Alkaline Phosphatase (ALP g/dl)

The mean value of ALP in pre treatment group (58.055± 1.422) and treatment group Group. A, B and C (51.833± 2.072, 56.166± 2.358 and 53± 2.265) increased non-significantly as compared to healthy control group (49.333± 2.917) however, non-significant difference was observed among pre-treatment, treatment group Gr. A, B and C (Table 7).

The significant (p<0.01) elevation of ALP, AST, ALT and serum cholesterol estimates in pre-treatment and treatment groups A, B and C of the present study is in some agreement with the reports of Dimri *et al.,* (2006), Arora *et al.,* (2013) and Haleem *et al.,* (2015), observed non-significant elevation of these parameters in demodectic mange. The elevation of these parameters could be due to the hepatic damage caused by toxic elements from mites (Kaneko *et al.,* 1997).

The mean values of Hb, PCV and TEC were significantly lower (P<0.01) in dogs suffering from demodectic mange as compared to control group indicating macrocytic anaemia in affected groups. This anaemia might be due to the stress arising from the disease. Significantly higher (P<0.01) TLC, neutrophils and eosinophilic counts were observed in demodectic mange affected dogs.

Hypoglycaemia found in affected animals was might be due to increased need of glucose during inflammatory reactions. A non-significant decrease (P< 0.01) was

observed in mean total protein and plasma albumin levels in demodectic mange affected dogs resulted due to excessive breakdown of proteins caused by trauma to the skin and proliferation of mites. The significant (p<0.01) elevation of ALP, AST, ALT and serum cholesterol were found in pre-treatment could be due to the hepatic damage caused by toxic elements from mites.

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