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Haemato-biochemical changes in small ruminants with haemoprotozoan diseases

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Abstract

Haemoprotozoan diseases is one of the important infectious aliments affecting small ruminants. Haemato-biochemical changes in small ruminants with haemoprotozoan diseaases was carried out. Animals with fever, lymphadenopathy, haemoglobinuria, tick infestation were screened. 100 number of samples were taken up for the study during the period of November 2024 to November 2025. These blood samples were subjected to haematology and serum biochemistry analysis. Reduction in haemoglobin, packed cell volume, erythrocyte and increase in total leucocyte count and differential count were observed. Elevated serum total bilirubin, aspartate amino transferase, alkaline phosphatase and gamma glutamyl transferase and magnesium were observed. Reduced serum albumin, iron and copper were noticed in these small ruminants.

Keywords: Haemoprotozoan diseases, haematology, serum biochemistry

Introduction

Parasitic infections represent one of the major limiting factors affecting the productivity and health of small ruminants, causing considerable economic setbacks, especially in developing and underdeveloped nations worldwide (Shah *et al*., 2019). The study is undertaken to evaluate the haemato-biochemical changes in small ruminants infected with haem protozoan diseases.

Materials and Methods

A total of 100 blood samples were collected from small ruminants, comprising 80 clinically infected (Group II) and 20 healthy animals (Group I) presented to the Large Animal Out-Patient Medicine Unit of the Madras Veterinary College Teaching Hospital, Vepery, Chennai during the period from November 2024 to November 2025. Haematological and serum biochemical parameters were analyzed using Mindray BC-2800 Vet Auto Hemoanalyzer and Auto biochemical analyser (A15 Biosystem Inc, Spain) respectively. Iron and copper were estimated using ProTech Serum Iron and Copper Estimation Kit by spectrophotometrically at 630 nm and 578 nm respectively.

Results and Discussion

The Mean ± S.E. values of haematological parameters in small ruminants belonging to control healthy animals Group I (n=10) and animals infected with HPD Group II (n=80) are detailed in Table 1.

are in agreement with the reports of Razmi *et al*. (2019) and Jayalakshmi *et al*. (2022). The blood pictures are normocytic to microcytic anemia, it resulting from intraerythrocytic parasitism, hemolysis, and enhanced erythrophagocytosis as reported by Velusamy *et al*. (2015). A highly significant rise ($p < 0.01$) recorded in total leukocyte count (TLC) and differential counts, reflect an active inflammatory and immunological response to parasitic invasion, corroborating the observations of Razmi *et al.* (2019). The Mean ± S.E. values of various biochemical parameters in small ruminants belonging to control healthy animals Groups I (n=20) and animals infected with HPD II (n=80) are presented in Table 2.

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Table 1: Mean ± S.E. values haematological parameters

Parameters	Group I (n=20)	Group II (n=80)	t value	p value
Haemoglobin (g/dl)	11.69 ± 0.35	7.36 ± 0.26	6.262	0.00**
PCV (%)	37.90 ± 0.31	20.98 ± 0.76	8.42	0.00**
RBC (millions/cmm)	14.08 ± 0.3	13.61 ± 0.59	0.301	0.76NS
MCV (fl)	26.43 ± 0.68	16.29 ± 0.52	7.28	0.00**
MCH (pg)	8.24 ± 0.24	5.73 ± 0.16	5.717	0.00**
MCHC (g/dl)	30.52 ± 0.85	35.61 ± 0.59	-3.187	0.00**
WBC cells/cmm	5970 ± 301.75	20144.93 ± 1191.26	-4.502	0.00**
Platelets (cells/cmm)	345187 ± 5100.06	307989.57 ± 8667.31	1.619	0.10NS
Neutrophils (cells/cmm)	2665.89 ± 147.67	11633.79 ± 946.82	-3.585	0.00**
Lymphocytes cells/cmm)	2970.52 ± 337.15	7525.57 ± 449.8	-3.813	0.00**
Monocytes (cells/cmm)	89.97 ± 16.61	754.89 ± 63.3	-4.038	0.00**

The low values of haemogram in parasitised animals

Table 2: Mean ± S.E. values of various biochemical parameters

Parameters	Group I (n=20)	Group II (n=80)	t value	p value
Glucose (mg/dl)	62.10 ± 2.09	87.62 ± 5.03	-1.916	0.05*
Cholesterol (mg/dl)	110.07 ± 3.82	118.00 ± 4.6	-0.597	0.55NS
Total Protein (g/dl)	7.19 ± 0.09	6.38 ± 0.16	1.877	0.06NS
Albumin (g/dl)	3.15 ± 0.1	2.54 ± 0.07	2.885	0.00**
Total Bilirubin (mg/dl)	0.06 ± 0.01	0.83 ± 0.06	-4.231	0.00**
Direct Bilirubin (mg/dl)	0.02 ± 0.003	0.56 ± 0.06	-3.644	0.00**
BUN (mg/dl)	18.26 ± 1.01	28.03 ± 2.31	-1.597	0.11NS
Creatinine (mg/dl)	1.14 ± 0.07	1.29 ± 0.14	-0.411	0.68NS
AST (IU/L)	93.70 ± 3.88	126.92 ± 14.62	-2.017	0.05*
ALP (IU/L)	92.50 ±7.21	214.08 ± 40.88	-2.675	0.01**
GGT (IU/L)	37.20 ±1.82	42.92 ± 1.75	-2.253	0.03*
Sodium (mmol/L)	147.88 ± 2.06	140.03 ± 1.14	2.537	0.01**
Potassium (mmol/L)	4.36 ± 0.16	4.09 ± 0.1	1.039	0.30NS
Chloride (mmol/L)	103.26 ± 1.41	105.95 ± 1.84	-0.549	0.58NS
Calcium (mg/dl)	10.53 ± 0.16	9.85 ± 0.19	1.322	0.19NS
Phosphorous (mg/dl)	4.82 ± 0.22	5.61 ± 0.32	-0.953	0.34NS
Magnesium (mg/dl)	2.21 ± 0.05	4.82 ± 0.17	-5.897	0.00**

A highly significant reduction ($p < 0.01$) in the mean serum albumin levels (2.54 ± 0.07) in small ruminants affected by haemoprotozoan diseases (HPD), are similar with results that were documented by Mahmoud *et al.* (2019) and Eliwa *et al.* (2021). The observed hypoalbuminemia in haemoprotozoan infections may be attributed to decreased hepatic synthesis due to liver dysfunction (Abdullah *et al.,* 2022). Haemoprotozoans infected small ruminants exhibited significantly higher aspartate aminotransferase (AST) (126.92 ± 14.62), alkaline phosphatase (ALP) (214.08 ± 40.88) and gamma-glutamyl transferase (GGT) (42.92 ± 1.75), aligning with earlier observations by Haq *et al*. (2021). The concentration of iron and copper in healthy and HPD infected animals are detailed in Table.3.

Table 3: Mean ± S.E of micro minerals in small ruminants infected with HPD and control healthy groups

S.No	Group I Control healthy Goats (n=10)	Group II Goats infected with HPD (n=68)	Group III Control healthy Sheep (n=10)	Group IV Sheep infected with HPD (n=12)	F value
Iron (µg/dl)	144.55 ± 5.62	148.72 ± 5.12	65.98 ± 8.99	55.47 ± 4.04	64.029**
Copper (µg/dl)	167.99 ± 6.05	105.12 ± 4.70	127.56 ± 5.69	81.83 ± 3.82	50.088**

Reduced serum iron and copper values in the diseases animal were in agreement with results documented by Sajid *et al.* (2023), who also reported lowered serum iron levels in sheep and goats affected with *Babesia*, *Theileria*, and *Anaplasma* infections. A decreased level of was observed in the infected animals when compared with the control group. Similar findings were described by Esmaeilnejad *et al*. (2012), who reported reduced serum copper concentration (hypocupremia) in *Babesia*-infected sheep and goats.

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