Full Length Article

# STUDY RELATED TO HAEMATOBIOCHEMICAL PROFILE OF SHEEP AND GOATS DUE TO GASTROINTESTINAL PARASITISM

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## ABSTRACT

*The haemato-biochemical profile of sheep and goat with gastrointestinal parasitism was studied. A total of 100 blood samples were collected from Nellore (Jodipi) sheep and Tellicherry goats, reared under the semi-intensive system in the University research farm in Madhavaram Milk Colony, Tamil Nadu Veterinary and Animal Sciences University (TANUVAS)***,** *Chennai, Tamil Nadu from January to June, 2022. The haemoglobin (Hb) value, packed cell volume (PCV) values and RBC values showed significant reduction.Similarly, the reduction of the differential count was also observed in infected sheep viz., lymphocyte and monocyte, whereas there was a significant increase in total neutrophil count, total eosinophil count and basophil in infected sheep as compared to healthy sheep. In goats, there was significant reduction in Hb, PCV, RBC and WBC values whereas there was a significant increase in total monocyte count in infected goat as compared to healthy goats.*

**Keywords:** Sheep, Goats, Gastrointestinal parasitism, Haemato-biochemical profile.

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## INTRODUCTION

Gastrointestinal parasitism (GIP) is a major threat and a primary constraint to sheep and goats and cause considerable economic losses (Da Silva *et al.,* 2014). Helminth infection in goats and sheep cause enteritis, anaemia, weight loss, low reproductive performance and death (Soundararajan and Iyue, 2003; Jas *et al*., 2008; Sharma *et al.,* 2014). Among the gastrointestinal parasites (GIP), strongyle nematodes are considered as one of the extremely pathogenic and economically significant parasites affecting small ruminants. Amongst gastrointestinal helminths of sheep and goats *Haemonchus contortus* is the predominant species and causes anaemia. Both adult and fourth stage larvae of *H.contortus* suck blood and migration

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of adult and larvae cause haemorrhages in to the abomasum (Soulsby, 1982). Serum biochemistry and haematological analysis are useful for assessing the health status of sheep and goats and may indicate the host tissue damage and also severity of infection (Otesile *et al.,* 1991). Hence, the haemato-biochemical profile of sheep and goats in an organized farm at Chennai, Tamil Nadu with gastrointestinal parasitism was undertaken.

## MATERIALS AND METHODS

### Study animals

A total of 100 adult sheep and goats (50 Nellore sheep and 50 Tellicherry Goats) at University Research Farm (URF), Tamil Nadu Veterinary and Animal Sciences University (TANUVAS), Chennai, Tamil Nadu were utilized for the study. All the animals were maintained under semi-intensive system of management with similar feeding, housing and health care. Sheep and goats infected with gastrointestinal parasitic ova/oocysts were grouped into infected animals and those animals free from gastrointestinal parasitic ova/oocysts were grouped into control group.

### Faecal sample collection

Ten grams faecal sample was collected directly from the rectum of each sheep and goats in a clean polythene bag. The faecal samples were analysed by faecal flotation technique by using salt solution for the presence of helminthes eggs and flotation by using sugar solution for the presence of amphistome eggs (Soulsby, 1982). The faecal samples of animals positive for eggs of helminthes eggs and coccidian oocysts were again subjected to quantitative evaluation by modified Mc Master's technique for the determination of level of parasitic infection (Eysker and Ploeger, 2000). Based on the presence/absence of parasitic eggs/ova in the faecal sample the animals were grouped into infected/healthy.

### Blood sample collection

Approximately 5 mL of blood samples were collected from the jugular vein of each animal and from there, 3 mL was transferred to a sterile vial containing ethylene diamine tetra-acetic acid (1 mg/mL of blood) for haematological parameters and rest 2 mL was transferred to vacutainer for serum preparation. Centrifugation was done at 1200 rpm for 10 min for serum separation. Then, the serum was transferred to Eppendorf tube for storing at −20°C. Serum samples were tested using Automatic Biochemical Analyzer (Automatic A15 Biosystems Analyzer, For Laboratory Use, Assays: Clinical Chemistry).

### Haematological analysis

Blood samples were collected from all sheep and goats by jugular venipuncture in both EDTA vacutainers and clot activating tubes for haematological and biochemical studies (Jain, 1993). Haematological parameters like haemoglobin (Hb,g%), packed cell volume (PCV, %), Red blood cell (RBC, µL), mean corpuscular volume (MCV, fL), mean corpuscular haemoglobin (MCH, pg), mean corpuscular haemoglobin concentration

(MCHC, g/dL), White blood cell (WBC) were analyzed using the automated haematology analyzer (Mindray – BC – 2800 VET, Shenzhen Mindray Bio-Medical Electronics Co., Ltd., China).

**Serum biochemistry**

Blood samples collected from sheep and goats in clot activating tubes were centrifuged at 3,000 rpm for 15 min for serum separation. Serum obtained after centrifugation was utilized or biochemical analysis. Biochemical parameters like Total protein (TP); Albumin (ALB);Glucose (GLC-); Blood urea nitrogen (BUN); Uric acid (UA); Total bilirubin (TB); Creatinine (CR); Total cholesterol (TC); Tri glycerides (TG); Alanine transaminase (ALT); Aspartate amino transferase (AST); Alkaline phosphatase (ALP); Calcium (Ca); Phosphorus (P) were estimated using semi-automated biochemical analyzer (A-15 Biosystem Random Access Analyzer, Biosystem, Barcelona, Spain) (Varley, 1975).

**Statistical analysis**

The data was analysed by student unpaired 't' test by IBM-SPSS version 23.0 for Windows.

## RESULTS AND DISCUSSION

In this study 100 faecal samples were collected from sheep and goats (50 sheep, 50 goats). Of which, 10 sheep and 15 goats were found positive for gastrointestinal parasites and kept as infected animals. The animals (40 sheep and 35 goats) free from parasitic infections were considered as control group (healthy animals).

**Haematology**

In the present study out of 50 sheep, 10 animals were found positive for helminth ova/coccidial oocysts (group 1) and the rest 40 were considered as healthy control (group 2). Significant low ($P<0.01$) in haemoglobin (Hb) value ($5.34 \pm 1.14$), packed cell volume (PCV) values ($13 \pm 2.01$), and RBC values ($7.27 \pm 1.97$) compared to control animals were observed. Similarly, the lower differential count was also observed in infected sheep. The values of MCV, MCH, MCHC and WBC were non-significant ($P<0.05$) (Table I) between infected and healthy sheep. Bordoloi *et al.* (2012) also observed decreased level of Hb concentration, PCV and TEC due to experimentally induced haemonchosis in Sahabadi sheep.

Out of 50 goats, 15 goats were detected positive for helminth ova/coccidial oocyts were included as group 1 and the rest of the animals were used as control (group 2). In the present study, there was significant lower ($P<0.01$) in Hb ($5.99 \pm 0.69$), PCV values ($17.61 \pm 1.77$), RBC ($12.78 \pm 3.60$), and WBC values ($14.41 \pm 4.85$). Ahmed *et al.*(2015) observed that there was significant lower in Hb, PCV and TEC in goats suffering from gastrointestinal parasitism in Jaipur district of Rajasthan.

Significant lower ($P<0.01$) in haemoglobin (Hb) value ($5.99 \pm 0.69$), packed cell volume (PCV) values ($17.61 \pm 1.77$),

and RBC values (12.78 ± 3.60) compared to control animals were observed. Similarly, the lower differential count was also observed in infected goats. Sharma *et al.* (2014) also reported that in pre-treatment values of parasitized goats, there was a significant decrease in haemoglobin, packed cell volume (PCV) and total erythrocyte count (TEC) as compared to the healthy control goats. This is similar to that of Bhat *et al.* (2004) and Amulya *et al.* (2014) who reported the reduction in PCV, Hb, RBC in infected animals and this may be due to acute loss of blood by sucking activity and haemorrhages caused by various parasites. The values of MCV, MCH, MCHC and WBC were non-significant (P<0.05) (Table III) between infected and healthy goats. As in this study, Awad *et al.* (2016) reported anaemia with leukocytosis; lymphocytosis, eosinophilia and monocytosis in infected sheep.

In the present study, anaemia, lower PCV, leucocytosis, eosinophilia were observed with GI parasitism. The reduction in PCV may be caused due to the acute loss of blood by sucking activity and haemorrhages caused by various parasites (Bordoloi *et al.* (2012). Kelkeles *et al.* (2012) reported progressive and severe anaemia and associated with weight loss and growth retardation with increased eosinophil population in all sheep infected with haemonchosis *Haemonchus contortus* infection was known to cause significant changes of haematological parameters like Hb, PCV and TEC and which may result in anaemia in infected animal (Sharma *et al.,* 2000; Bordoloi *et al.,* 2012). It was estimated that an adult *H. contortus* can suck 0.05 mL of blood/day (Urquhart, 1996; Soulsby, 1982).

**Serum biochemistry**

In the present study, there is a significant reduction of Total protein (4.81 ± 0.78), Albumin (2.2 ± 0.13), Blood Urea Nitrogen (19.43 ± 6.24), Total cholesterol (0.94 ± 0.10), Total bilirubin (58.5 ± 16.64), Alkaline phosphatase (119 ±48.61) and Calcium (10.95 ± 14.58) in infected sheep than the healthy sheep. Highly significant differences (P<0.01) were observed in the Total protein and Triglycerides and significant difference (P<0.05) were in Albumin and Total cholesterol between infected and health sheep. There is a significant increased value of Uric acid (3.38 ± 0.71), Tri glycerides (25.60 ± 10.26), Alanine transaminase (27.4 ± 14.43), Aspartate aminotransferase (96.5 ± 32.60) in infected sheep than the healthy sheep (Table II).

In the present study, there is a significant reduction of Total protein (4.50 ± 0.83), Albumin (2.11 ± 0.44), Total cholesterol (0.58 ± 0.06), Total bilirubin (62.13 ± 19.40), Alanine transaminase (20.40 ± 6.88), Aspartate aminotransferase (85.53 ± 23.97), Alkaline phosphatase (206.6 ± 225.13) and Calcium (6.82 ± 2.99) in infected goats than the healthy goats. Highly significant differences (P<0.01) in the Total protein and Albumin and significant (P<0.05) were uric acid. There is a significant increased value of glucose (53.60 ± 13.53), uric acid (2.98 ± 1.12), Tri glycerides (19.4 ± 8.55) in infected goats than the healthy goats (Table IV).

**Table I: Haematological values of sheep infected with gastrointestinal parasitism**

| VARIABLES | Infected sheep (Group 1) (10) | | | Apparently healthy sheep (Group 2) (40) | | | t - Test | P - Value | RESULT |
|---|---|---|---|---|---|---|---|---|---|
| | N1 | MEAN (X) | ±SE (X) | N2 | MEAN (Y) | ±SE (Y) | | | |
| Haemoglobin | 10 | 5.34 | 0.3625 | 40 | 10.97 | 0.2544 | 10.40 | 0.0000 | ** |
| Packed cell volume | 10 | 13.00 | 0.6372 | 40 | 29.16 | 0.7113 | 11.02 | 0.0000 | ** |
| Red blood cell | 10 | 7.27 | 0.6243 | 40 | 12.25 | 0.7613 | 3.18 | 0.0026 | ** |
| Mean corpuscular volume | 10 | 27.36 | 1.2278 | 40 | 26.64 | 0.3557 | 0.77 | 0.4460 | NS |
| Mean corpuscular haemoglobin | 10 | 10.25 | 0.2964 | 40 | 9.98 | 0.0985 | 1.11 | 0.2715 | NS |
| Mean corpuscular haemoglobin concentration | 10 | 37.99 | 0.7322 | 40 | 37.80 | 0.2506 | 0.30 | 0.7640 | NS |
| White blood cell | 10 | 13.08 | 1.2709 | 40 | 11.47 | 0.4309 | 1.51 | 0.1370 | NS |

**Table II: Serum biochemical values of sheep infected with gastrointestinal parasitism**

| VARIABLES | Infected sheep (Group 1) (10) | | | Apparently healthy sheep (Group 2) (40) | | | t - Test | P - Value | RESULT |
|---|---|---|---|---|---|---|---|---|---|
| | N1 | MEAN (X) | ±SE (X) | N2 | MEAN (Y) | ±SE (Y) | | | |
| Total protein | 10 | 4.81 | 0.2496 | 40 | 7.44 | 0.0808 | 12.99 | 0 | ** |
| Albumin | 10 | 2.11 | 0.1138 | 40 | 2.42 | 0.06 | 2.51 | 0.015 | * |
| Glucose | 10 | 51 | 2.0166 | 40 | 50.93 | 1.917 | 0.02 | 0.9852 | NS |
| Blood urea nitrogen | 10 | 19.43 | 1.9763 | 40 | 20.8 | 0.9985 | 0.61 | 0.5433 | NS |
| Uric acid | 10 | 0.95 | 0.0332 | 40 | 1.03 | 0.034 | 1.2 | 0.237 | NS |
| Total bilirubin | 10 | 0.84 | 0.0479 | 40 | 0.9 | 0.0555 | 0.56 | 0.5774 | NS |
| Creatinine | 10 | 58.5 | 5.2626 | 40 | 63.59 | 2.949 | 0.79 | 0.4349 | NS |
| Total cholesterol | 10 | 3.38 | 0.226 | 40 | 2.92 | 0.0688 | 2.62 | 0.0118 | * |
| Tri glycerides | 10 | 3.38 | 0.226 | 40 | 2.89 | 0.0688 | 2.76 | 0.0082 | ** |
| Alanine transaminase | 10 | 27.4 | 4.5636 | 40 | 24.33 | 1.384 | 0.86 | 0.3931 | NS |
| Aspartate aminotransferase | 10 | 96.5 | 10.311 | 40 | 91.38 | 3.7116 | 0.57 | 0.5714 | NS |
| Alkaline phosphatase | 10 | 119 | 15.3739 | 40 | 154.81 | 16.256 | 1.07 | 0.2918 | NS |
| Calcium | 10 | 10.96 | 4.5979 | 40 | 12.21 | 2.3373 | 0.24 | 0.8104 | NS |
| Phosphorus | 10 | 11.05 | 1.4226 | 40 | 11.85 | 0.7607 | 0.48 | 0.636 | NS |

**Table III: Haematological values of goats infected with gastrointestinal parasitism**

| VARIABLES | Infected goat (Group 1) (15) | | | Apparently healthy goat (Group 2) (35) | | | t - Test | P - Value | RESULT |
|---|---|---|---|---|---|---|---|---|---|
| | N1 | MEAN (X) | ±SE (X) | N2 | MEAN (Y) | ±SE (Y) | | | |
| Haemoglobin | 15 | 5.99 | 0.1530 | 35 | 9.21 | 0.1898 | 11.81 | 0.0000 | ** |
| Packed cell volume | 15 | 17.61 | 0.3618 | 35 | 25.99 | 0.5370 | 11.17 | 0.0000 | ** |
| Red blood cell | 15 | 12.78 | 0.8006 | 35 | 14.60 | 0.3342 | 2.42 | 0.0187 | * |
| Mean corpuscular volume | 15 | 18.15 | 0.4249 | 35 | 17.88 | 0.3305 | 0.48 | 0.6353 | NS |
| Mean corpuscular haemoglobin | 15 | 6.20 | 0.1138 | 35 | 6.25 | 0.0884 | 0.34 | 0.7385 | NS |
| Mean corpuscular hemoglobin concentration | 15 | 34.43 | 0.3172 | 35 | 35.39 | 0.2064 | 2.52 | 0.0151 | * |
| White blood cell | 15 | 14.41 | 1.2548 | 35 | 18.89 | 1.0342 | 2.51 | 0.0155 | * |

**Table IV: Serum biochemical values of goats infected with gastrointestinal parasitism**

| VARIABLES | Infected goat (Group 1) (15) | | | Apparently healthy goat (Group 2) (35) | | | t - Test | P - Value | RESULT |
|---|---|---|---|---|---|---|---|---|---|
| | N1 | MEAN (X) | ±SE (X) | N2 | MEAN (Y) | ±SE (Y) | | | |
| Total protein | 15 | 4.51 | 0.2168 | 35 | 8.15 | 0.1791 | 11.81 | 0 | ** |
| Albumin | 15 | 2.11 | 0.1138 | 35 | 2.69 | 0.0894 | 3.72 | 0.0005 | ** |
| Glucose | 15 | 53.07 | 3.4935 | 35 | 50.96 | 2.2131 | 0.52 | 0.6085 | NS |
| Blood urea nitrogen | 15 | 22.22 | 1.3876 | 35 | 22.63 | 0.7767 | 0.28 | 0.784 | NS |
| Uric acid | 15 | 0.59 | 0.017 | 35 | 0.66 | 0.0209 | 2.26 | 0.0287 | * |
| Total bilirubin | 15 | 0.83 | 0.0566 | 35 | 0.93 | 0.0548 | 1.05 | 0.3 | NS |
| Creatinine | 15 | 62.13 | 5.0113 | 35 | 69.74 | 2.8263 | 1.4 | 0.1665 | NS |
| Total cholesterol | 15 | 62.13 | 5.0113 | 35 | 69.74 | 2.8263 | 1.4 | 0.1665 | NS |
| Triglycerides | 15 | 19.4 | 2.2099 | 35 | 18.37 | 1.8326 | 0.33 | 0.7457 | NS |
| Alanine transaminase | 15 | 20.4 | 1.7776 | 35 | 25.67 | 1.5442 | 2 | 0.0514 | NS |
| Aspartate aminotransferase | 15 | 85.53 | 6.1898 | 35 | 92.44 | 4.494 | 0.87 | 0.3907 | NS |
| Alkaline phosphatase | 15 | 206.6 | 58.1308 | 35 | 299.37 | 39.2707 | 1.31 | 0.1979 | NS |
| Calcium | 15 | 6.83 | 0.7744 | 35 | 8.18 | 1.0868 | 0.77 | 0.4422 | NS |
| Phosphorus | 15 | 10.74 | 1.1067 | 35 | 11.74 | 0.7236 | 0.76 | 0.4528 | NS |

In this study, hypoproteinaemia, hypoalbuminaemia and hypoglycaemia were observed, whereas increased AST, ALT and total bilirubin were observed in infected animals compared to control animals which is in accordance to that of Kumar *et al.* (2015) and Bordoloi *et al.* (2012) also studied changes in the haemato-biochemical pattern due to experimentally induced haemonchosis in Sahabadi and observed decrease in serum protein. The lower in total protein and albumin and elevated level of globulin might be attributed to the diversion of amino-N and energy from muscle, bone and collagen fibre. This in turn increases the endogenous losses of protein through urinary and faecal excretion.

The lower level of total serum protein and albumin observed in the present study.The animals infected with severe gastrointestinal parasites showed lower serum albumin and significantly higher Aspartate aminotransferase values, compared to the healthy animals and also reported a significant lower in the total protein concentration and albumin in the serum of infected sheep as compared with normal sheep (Ashok Kumar *et al.,* 2005; Minnat *et al.,* 2014; Ahmed *et al.,* 2015; Awad *et al.,* 2016).

**Faecal egg counts**

Examination of dung samples from both sheep and goats revealed the presence of tape worm eggs (*Monezia* eggs), round worm eggs (Strongyle, *Strongyloides* and *Trichuris* eggs) and protozoan parasites ova (*Eimeria* oocysts). Satish *et al* (2018) also reported the eggs of amphistomes, strongyles, *Strongyloides papillosus* and *Trichuris sp*. in the faecal samples of sheep and goats. The mean egg per gram (epg) for strongyles was 960 and 933.33 while the mean oocyst per gram (opg) of *Eimeria* spp. was 375 and 420 respectively.

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