

HAEMATO-BIOCHEMICAL ALTERATIONS IN GASTROINTESTINAL DISORDERS OF SHEEP WITH PARASITIC INFECTION

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Present study investigated the haemato-biochemical changes in gastrointestinal tract (GIT) disorders of sheep with parasitic infection. Study was conducted on 21 sheep (6 healthy and 15 diseased sheep/lambs). Haematological studies revealed significantly decreased values of haemoglobin, packed cell volume and total erythrocyte count. Erythrocytic indices of infected sheep revealed normocytic hypochromic anaemia as there was no change in mean corpuscular volume (MCV) but significant decrease in mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC). Total leucocyte count revealed significant leucocytosis due to neutrophilia, lymphocytosis, monocytosis and eosinophilia and no significant change was observed in erythrocyte sedimentation rate. No haemoprotozoan parasites were detected in blood smear. Serum biochemical profiles of diarrhoeic sheep/lambs indicated significant decrease in values of total protein, serum albumin, serum globulin, albumin:globulin ratio and glucose where as significant increase in the activity of aspartate aminotransaminase, alanine aminotransaminase, alkaline phosphatase, gamma glutamyl transferase and increase in the level of total bilirubin. Parasitic examination of faecal sample of diarrhoeic sheep revealed infection of *Strongyles*, *Strongyloides* spp., *Trichuris* spp and *Eimeria* spp.

Key words: Sheep, Gastrointestinal, Haemato-biochemical, Parasitic infection

Agriculture plays an important role in Indian economy and animal husbandry is an integral part of Indian agriculture. India ranks second in sheep population (71.56 million) in the world (FAO, 2010). Of this 0.63 million sheep account from Haryana [Anon, 2012]. Although safe and effective

treatment and control methods exist for the most internal and external parasites, many animals continue to suffer from preventable parasitic infections.

Gastrointestinal parasitism is considered as a major challenge for the health and the

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welfare of sheep. Parasitism, especially by helminthic parasites, impairs health by causing inappetance, diarrhoea, anaemia and in severe cases death (Kumar *et al.*, 2015a). The nematode parasite, *Haemonchus contortus*, is singly the most important nematode pathogen of small ruminants throughout the world. Although considered to be the greatest problem in the tropics/subtropics, this parasite has shown a definite trend of increasing prevalence and economic importance in sheep flocks (Kumar *et al.*, 2015b). Other internal parasitic infections seen in sheep are adult tapeworms (*Moniezia* spp.) and several intermediate stages (metacestodes) of tapeworms (*Taenia* spp.). Hemato-biochemical parameters are very sensitive indicators for the degree of hepatic damage and the parasitic infection severity, in which liver damage upsets the vital metabolic processes for normal health and optimum productivity of the animal.

MATERIALS AND METHODS

Ethical approval: The study was conducted after the approval of the Institutional Animal Ethics Committee.

Faecal examination for parasitic eggs and ova : Fecal samples were collected directly from the rectum from clinical cases of sheep/lamb having GIT disorders. These fecal samples were examined for the presence of helminthic ova, both heavy and light, and coccidial oocysts. For examination, floatation and sedimentation methods were employed (Anon, 1977).

Haematological examination: 21 blood

samples were collected from sheep (6 healthy sheep and 15 diseased sheep) from sheep breeding farm, LUVAS, Hisar and Central Sheep Breeding Farm, Hisar.

About 5mL of blood was collected through jugular vein aseptically in the clean sterilized glass vials containing anticoagulant i.e. ethylene diamine tetra acetic acid (EDTA). In addition to this 10 mL of blood was collected without anticoagulant in clean and sterilized glass vials and allowed to clot at room temperature to separate serum. Clot was allowed to retract in refrigerator at 4°C and centrifuged at 3000 r.p.m. for 3 minutes. After that serum was collected with Pasteur pipette and stored in deep freeze (-20°C) in vials till further use.

Haematological parameters viz., haemoglobin (Hb), total leucocyte count (TLC), differential leucocyte count (DLC), total erythrocyte count (TEC), packed cell volume (PCV), erythrocyte sedimentation rate (ESR), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were estimated following the method of Benjamin (1985) within six hours of blood collection. Absolute leucocyte counts were derived from DLC and TLC values.

Serum biochemical examination: Serum biochemical parameters were determined by using Technicon Ames RA-50 chemistry analyzer using diagnostic kits of ERBA

(Anon, 1990). The levels of the various plasma constituents were determined viz. total protein (TP), albumin, total bilirubin, direct bilirubin and glucose concentration, enzyme activities of alkaline phosphatase (ALKP), alanine aminotransferase (ALT), aspartate aminotransferase (AST), gamma glutamyl transferase (GGT). The gamma-globulin levels were also measured and the albumin: globulin ratio was calculated.

Statistical analysis: The Student's t-test using SPSS statistics 17.0 software (IBM Corporation, New York, USA) was applied to statistically analyze the results obtained with different study groups.

RESULTS

Parasitological findings: The results of parasitic findings in 15 diarrhoeic sheep/lambs revealed that *Strongyle* eggs (11 cases) were the major infestation, followed by *Strongyloides* spp. (6 cases), *Eimeria* spp. (4 cases) and *Trichuris* spp. (3 cases). In lambs of age group less than 2 months, faecal samples of all the 4 cases revealed presence of parasitic eggs. Out of these 4 cases, in 2 cases there was mixed infestation of *Strongyles* and *Eimeria* spp. whereas in one case eggs of *Strongyles* spp. and *Strongyloides* spp. were seen. In lambs of age groups >2 upto 6 months, 1 case revealed infestation of *Strongyles* spp., *Strongyloides* spp. and *Trichuris* spp. Mixed infestation of *Strongyles* spp. and *Strongyloides* spp. was evidenced in 1 case whereas 1 case showed mixed infestation of *Strongyles*

spp. and *Trichuris* spp. Infestation of only *Trichuris* spp. was shown in 1 case whereas 1 case revealed infestation of only *Eimeria* spp. In lambs of age groups > 6 months upto 1 year, 3 cases revealed only infestation of *Strongyles* spp. whereas mixed infestation of *Strongyles* spp. and *Strongyloides* spp. was found in 1 case whereas mixed infestation of *Strongyles* spp. and *Trichuris* spp. was shown by 1 case. Likewise in sheep of age groups >1 year eggs of only *Strongyles* spp. was revealed from 1 case and eggs of *Strongyloides* spp. was evidenced in 1 case. All these animals were found negative for haemoprotozoan parasites in blood smear examination.

Haematological studies: It was evident that there was significant decrease ($P \leq 0.05$) in value of haemoglobin (7.57 ± 0.19 g/dL), packed cell volume (27.06 ± 0.49 %), total erythrocyte count ($8.23 \pm 0.20 \times 10^6/\text{mm}^3$) and significant increase in leucocytic value ($17.71 \pm 0.32 \times 10^3/\text{mm}^3$) in animals affected with GIT disorders when compared with the corresponding values of healthy animals. There was significant decrease in the values of erythrocyte indices of diseased animals i.e. mean corpuscular haemoglobin (MCH) (9.24 ± 0.27 g/dL), mean corpuscular haemoglobin concentration (MCHC) (28.12 ± 0.96 pg) but mean corpuscular volume (MCV) showed increasing pattern though insignificant (33.18 ± 1.12 fl), when compared with healthy animals. Such variation in erythrocytic indices indicated normocytic hypochromic anaemia. Differential

leucocyte counts were used to calculate absolute counts using total leucocyte count values. Total leucocyte counts of healthy and diarrhoeic sheep were $7230 \pm 1.26/\mu\text{L}$ and $17710 \pm 0.32/\mu\text{L}$, respectively. Differential leucocyte counts in healthy sheep were neutrophils $28.83 \pm 2.24\%$, lymphocytes $62.83 \pm 2.24\%$, eosinophils $7.17 \pm 0.48\%$ and monocytes $2.83 \pm 0.48\%$ whereas in diarrhoeic sheep were neutrophils $38.61 \pm 0.56\%$, lymphocytes $51.41 \pm 0.56\%$, eosinophils $6.80 \pm 0.28\%$ and monocytes $3.20 \pm 0.28\%$. It was evident from these finding that in animals affected with GIT disorders due to parasitic infections; there is significant increase ($P \leq 0.05$) in absolute values of eosinophils ($568.10 \pm 51/\mu\text{L}$, 3.21%), lymphocyte ($9105.2 \pm 204.32/\mu\text{L}$, 51.42%), monocytes ($1202.50 \pm 51.34/\mu\text{L}$, 6.8%) and neutrophils ($6831 \pm 146.03/\mu\text{L}$, 38.58%) was observed when compared with the value of healthy animals. No significant change was evidenced with respect to erythrocytic sedimentation rate (ESR).

Serum biochemical studies: It was evident from serum biochemical studies that there was significant decrease ($P \leq .05$) in values of total protein (4.24 ± 0.16 g/dL), serum albumin (1.95 ± 0.12 g/dL), serum globulin (2.29 ± 0.08 g/dL), albumin : globulin ratio (0.87 ± 0.06) and serum glucose (50.05 ± 1.65 mg/dL) in animals affected with GIT disorders. A significant ($P \leq 0.05$) increase in activities of aspartate aminotransferase (184.5 ± 7.23 IU/L), alanine aminotransferase (42.46 ± 1.24 IU/L), alkaline phosphatase (179.41 ± 5.89 IU/L),

gamma-glutamyl transferase (76.33 ± 1.53 IU/L), total bilirubin (0.15 ± 0.016 mg/dL), conjugated bilirubin (0.09 ± 0.009 mg/dL) and unconjugated bilirubin (0.06 ± 0.009 mg/dL) was observed in the animals showing GIT disorders. No significant change was evidenced with respect to serum amylase.

DISCUSSION

Parasitological findings revealed isolation of *Strongyle* spp. followed by *Strongyloides* spp., *Trichuris* spp. and *Eimeria* spp. Maximum parasitic infection was in sheep of age group 2 to 6 months followed by age groups > 6 months upto 1 year, < 2 months and least in age group of > 1 year. Mixed parasitic findings revealed maximum cases of mixed infection of *Strongyle* spp. and *Strongyloides* spp. followed by *Strongyloides* spp. and *Trichuris* spp. These findings were in general, agreement with those reported by Mederos *et al.* (2010).

Haematological studies of blood collected from diarrhoeic sheep/lambs revealed significantly decreased values of haemoglobin (Hb), packed cell volume (PCV) and total erythrocyte count (TEC). Absolute leucocytic count revealed significant leucocytosis due to neutrophilia, lymphocytosis, monocytosis and eosinophilia and no effect was seen on erythrocyte sedimentation rate (ESR). An analysis of erythrocytic indices of sheep/lambs revealed that there was no significant change in mean corpuscular volume but significant decrease in mean corpuscular

haemoglobin and mean corpuscular haemoglobin concentration indicating normocytic hypochromic anaemia. The haematological studies in present investigations were in unison with the observation of Ahmad and Ansari (1989); Egbe Nwiyi *et al.* (1999); Dhanlakshmi *et al.* (2002); Zaki *et al.* (2003) and Purohit *et al.* (2003).

Serum biochemical profiles of diarrhoeic sheep/lambs in present study showed significant decrease in values of total protein, serum albumin, serum globulin, serum glucose and the albumin: globulin ratio. These results are in agreement with finding of Uppal and Rai (1978); Maiti *et al.* (1999); Dhanlakshmi *et al.* (2002) and Purohit *et al.* (2003). Inappetance with resultant reduction in dietary protein and plasma losses from damaged intestinal mucosa might be the main cause for hypoproteinemia. The inflammation of intestine by development stages of parasites might also because of poor absorption of protein metabolites resulting low level of total protein (Purohit *et al.*, 2003). Low serum glucose in the diarrhoeic animals might be due to decreased appetite of animals, decreased absorption into the blood stream and rapid absorption and utilization of soluble carbohydrate and lipids from the gut by parasites (Radostits *et al.*, 2000). The activity of aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, gamma glutamyl transferase and serum level of total bilirubin, conjugated bilirubin and

unconjugated bilirubin were significantly increased in diarrhoeic sheep/lambs and goats/kids. Similar finding were also reported by Prasanthi *et al.* (1999); Zaki *et al.* (2003) and Kumar *et al.* (2015b). Increase in enzymatic activities might be due to pathological lesions of intestine, liver and cardiac muscle (Radostits *et al.*, 2000) which were also be evidenced in presented studies. There was no significant change in the serum amylase activity of both species. It might be due to no damage of pancreas in gastrointestinal disorder and also serum amylase in ruminants have very little role in digestion because carbohydrate fraction of feed undergoes fermentation in rumen and it is converted into volatile fatty acids. So, very little carbohydrate reaches intestine. There seems to be no report regarding serum amylase activity in sheep/goats in gastrointestinal disorders in literature.

Parasitological findings revealed infection of Strongyle followed by *Strongyloides* spp., *Trichuris* spp. and *Eimeria* spp. Haematological studies evidenced the significant decrease in values of haemoglobin (Hb), packed cell volume (PCV) and total erythrocyte count (TEC). Absolute leucocytic count revealed significant leucocytosis due to neutrophilia, lymphocytosis, monocytosis and eosinophilia and no effect was seen on erythrocyte sedimentation rate (ESR). Serum biochemical profiles of diarrhoeic sheep/lambs in present study showed significant decrease in values of total protein,

serum albumin, serum globulin, serum glucose and the albumin: globulin ratio.

Conflict of Interest: Authors declare that there is no conflict of interest regarding the present research work.

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