RESEARCH ARTICLE

Study on Clinico-Haematol-Biochemical Alterations in Goats Suffering from Trichostrongylosis in Anand District of Gujarat

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Abstract

This cross-sectional study was aimed at determining the effect of trichostrongylosis on clinical, hematological, and biochemical parameters in goats. The study included eight healthy control goats and 48 naturally infected goats from the Anand district of Gujarat. The cases having a history of diarrhea, anorexia, weakness, dullness, loss of weight, and not dewormed were selected. Fecal samples of infected goats were examined by direct smear method for the presence of *Trichostrongylus spp.* eggs and the infection was confirmed by quantitative evaluation and coproculture of the samples for the identification of larvae. The result indicated that the infected goats had significantly elevated rectal temperature, pulse rate, and respiration rate along with diarrhea, dullness, depression, emaciation, and loss of condition. Moreover, there was a significant decrease in the mean Hb, TEC, PCV, lymphocyes, as well as serum total protein, calcium and phosphorus, and a significant increase in TLC, neutrophils, eosinophils, ALT, AST and ALP in infected goats.

Keywords: Anthelmintics, Coproculture, Goat, Haemato-biochemical profile, Micrometry, *Trichostrongylus spp*.

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Introduction

Goat is a versatile animal known as the "poor man's cow" in India and wet nurse of infants in Europe. Goats are often infested with internal and external parasites. The disease caused by internal worms *Trichostrongylus* is called trichostrongylosis. *Trichostrongylus,* also called hairworm, is a parasitic roundworm belonging to the superfamily: *Trichostrongyloidae,* family: *Trichostrongylidae* and genus *Trichostrongylus* (Soulsby, 2005). Goats infected with internal parasites show rough dull-coat, weakness, diarrhea, apathy, tail rubbing, signs of hypoproteinaemia, loss of appetite, and weight loss (Risso *et al.,* 2015; Kaplan, 2016). The incidence of trichostrongylosis in sheep and goats was reported by Godara *et al*. (2011) and Jaiswal *et al*. (2013). The anthelmintic activity and therapeutic efficacy of fenbendazole, levamisole and ivermactin have been studied in goats (Godara *et al.,* 2011, Jaiswal *et al.,* 2013, Das *et al.,* 2016). Many gastrointestinal nematodes develop resistance against anthelmintic drugs, and the drugs are not effective in controlling the worm infection; it leads to high mortality in infected goats. Hence, the present study was conducted to ascertain the severity of trichostrongylosis infection and its effect on haemato-biochemical alterations in goats.

Materials and Methods

The clinical cases of trichostrongylosis in goats brought to the Veterinary Clinical Complex, Anand as well as those observed by the door to door visits of villages nearby Anand were registered. The cases having a history of diarrhea, anorexia, weakness, dullness, emaciation, loss of weight, and not dewormed were selected. The clinical examination was carried out, and fecal samples were collected from such cases for microscopic examination. Those cases were having the presence of eggs and/or larvae of *Trchostrongylus* spp. on coproculture of fecal samples only were included in this study (Figures. 1, 2). Blood samples (approx. 2 mL) were withdrawn from the jugular vein in sterile K_3EDTA vaccutainers from the healthy (n = 8) and diseased (n = 48) goats for manual hematological analysis. About 4 ml of blood was also withdrawn in sterile plain vaccutainers, which was centrifuged at 3000 rpm for 10 minutes to separate out the serum. Serum was stored at -20°C for serum biochemistry. The levels of serum aspartate and alanine aminotransferases (AST-

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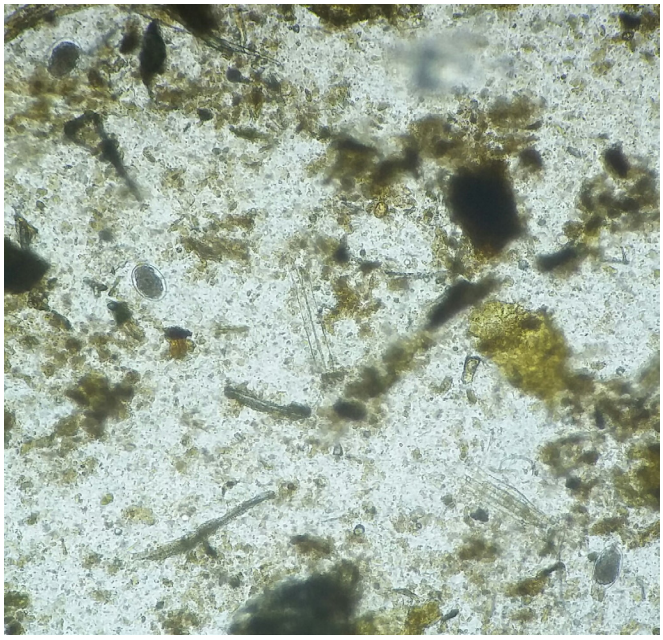

Fig. 1 : Embryonated eggs of *Trichostrongylus spp.* (10 X)

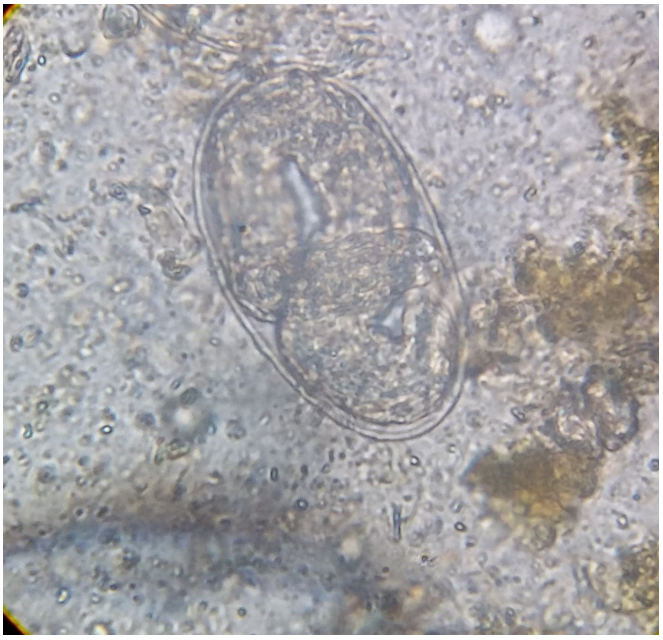

Fig. 2 : Egg of *Trichostrongylus spp.* containing larvae (40 X)

ALT), alkaline phosphatase (ALP), total protein (TP), calcium and phosphorus concentrations were determined using assay kits of Coral Clinical System, Goa on biochemistry analyser. The data were compared by employing student's t test for variations between healthy and infected goats (Snedecor and Cochran, 1994).

Result and discussion

Clinical Signs

The mean values of rectal temperature heart rate and respiration rate were found to be significantly ($p < 0.05$; $p < 0.01$) elevated in trichostrongylosis infected goats in comparison to healthy goats (Table 1). The clinical manifestations observed in trichostrongylosis infected goats were anorexia, diarrhea, weight loss, production loss, depression, dry hair coat, pale mucous membranes, dehydration, weakness, emaciation, abdominal pain and inability to stand. These findings were in accordance with the observations of Soulsby (2005), Risso *et al*. (2015), and Kaplan (2016). These manifestations might be due to loss of fluid from the body/dehydration of the animals as a result of enteritis, diarrhea and altered blood volume leading to increased metabolic rate (Radostits *et al*., 2007).

Hematological Alterations

The findings on blood parameters observed in healthy and *Trichostrongylus* infected goats are presented in Table 2.

Hemoglobin and Packed cell volume

The mean values of hemoglobin concentration and packed cell volume were found to be decreased significantly ($p < 0.01$) in trichostrongylosis infected goats as compared to healthy goats (7.30 ± 0.05 vs. 10.19 ± 0.19 g/dL and 22.23 ± 0.17 vs. 29.89 ± 0.49 %). These findings concurred well with the earlier reports of Jayraw and Raote (2004), Jas *et al*. (2008), Akanda *et al*. (2014), and Ahmed *et al*. (2015)). Risso *et al*. (2015) observed that some trichostrongyle nematodes caused anemia due to their ability to remove red blood cells as well as proteins, which can lead to ill-thrift in animals.

Total erythrocyte count

There was highly significant ($p < 0.01$) decrease in erythrocyte count in goats infected with trichostrogylosis as compared to healthy goats ($7.77 \pm 0.07 \times 10^6$/µL vs. $12.02 \pm 0.43 \times 10^6$/µL). This observation was in accordance with Jayraw and Raote (2004) and Jas *et al*. (2008). The mean erythrocyte count of $12.02 \pm 0.43 \times 10^6$/µL recorded in the healthy goats was in agreement with the value reported by Radostits *et al.* (2007).

Total leukocyte count

The mean total leukocyte count in healthy and trichostrongylosis infected goats was recorded as $10.01 \pm 0.12 \times 10^3$/µL and $13.28 \pm 0.19 \times 10^3$/µL, respectively. It was significantly ($p < 0.01$) higher in goats infected with trichostrongylosis as compared to the healthy goats. Similar findings were also

Table 1: Physiological parameters in healthy and trichostrongylosis infected goats

Sr. No.	*Parameter*	*Healthy goats (n = 8)*	*Infected goats (n = 48)*
1	Rectal temperature (°F)	101.63 ± 0.15	102.79 ± 00.21*
2	Heart rate (beats/min)	77.13 ± 0.48	90.88 ± 00.28**
3	Respiration rate (breaths/min)	24.13 ± 0.29	28.38 ± 00.35**

**p <0.01, *p <0.05.

Table 2: Haematology (Mean ± SE) of healthy and trichostrongylosis infected goats

Sr. No.	*Parameter*	*Healthy goats (n = 8)*	*Infected goats (n = 48)*
1	Hb (g/dL)	10.19 ± 0.19	7.30 ± 0.05**
2	PCV (%)	29.89 ± 0.49	22.23 ± 0.17**
3	TEC ($\times 10^6$/µL)	12.02 ± 0.43	7.77 ± 0.07**
4	TLC ($\times 10^3$/ µL)	10.01 ± 0.12	13.28 ± 0.19**
5	Neutrophils (%)	30.75 ± 0.99	44.25 ± 0.26**
6	Lymphocytes (%)	62.50 ± 0.90	44.72 ± 0.28**
7	Monocytes (%)	04.00±0.32	04.23±0.03
8	Eosinophils (%)	02.50 ± 0.27	06.55 ± 0.14**
9	Basophils (%)	00.25 ± 0.16	00.24 ± 0.01

**p <0.01.

reported by Abdel *et al*. (2002), Jayraw and Raote (2004), and Jas *et al*. (2008).

Differential leukocyte count

The mean values of differential leukocytes counts presented in Table 2 revealed that neutrophils and eosinophils were found to be increased significantly, and lymphocytes decreased (p <0.01) in trichostrongylosis infected goats as compared to healthy ones. These findings were in agreement with Abdel *et al*. (2002), Jayraw and Raote (2004) and Ahmed *et al.* (2015). Anemia with eosinophilia is a common hematological finding in endoparasitic infection in animals. In infected goats, neutrophilia might be due to secondary bacterial infection. However, the differences in values of monocytes and basophils between infected and healthy goats were statistically non-significant.

Biochemical Alterations

The serum biochemical parameters of healthy and trichostrongylosis infected goats are presented in Table 3.

Enzymes ALT, AST, and ALP

The mean values of all three enzymes, *viz.,* ALT, AST, and ALP were increased highly significantly (p<0.01) in trichostrongylosis infected goats in comparison to healthy goats (Table 3). These findings agreed with the reports of Mehta (2001) and Bahrami *et al*. (2011). This change in activities of ALP, ALT, and AST enzymes in serum may be due to increase in transmission activity and grater liberation of enzymes from damaged and necrosed tissues, degeneration of cellular membrane, and loss and collapse of diffuse tissue inflammation (Kaneko *et al*., 1997).

Total protein

The mean values of serum total protein in healthy goats and those infected with trichostrongylosis were 06.82 ± 0.18 g/dL and 05.65 ± 0.07 g/dL, respectively. The significant reduction in total protein level obtained in the present study was in agreement with the findings of Raheman and Collins (1991), Mehta (2001), Kumar *et al.* (2005), Jas *et al.* (2008), Bahrami *et al*. (2011) and Ahmed *et al*. (2015). The decrease in total serum protein level might be due to damage caused to the GI tract by parasites leading to hemorrhage and subsequent protein leakage through the injured gut. Maldigestion and malabsorption of nutrients through the injured gut result in a significant decrease in total plasma protein (Radostits *et al*., 2007; Vijay *et al*., 2010).

Calcium and Phosphorus

The mean values of serum calcium in healthy goats and goats infected with trichostrongylosis were 10.28 ± 0.08 and 08.72 ± 0.07 mg/dL, respectively (p <0.01) and those of serum phosphorus 4.73 ± 0.15 and 04.28 ± 0.03 mg/dL (p <0.05). The significant reduction in calcium and phosphorus levels observed in the present study was in agreement with the findings of Kumar *et al*. (2005) in goats and Vijay *et al*. (2010) in sheep. The hypocalcemia and hypophosphatemia may be induced by decreased feed intake, impaired digestion, diarrhea and disturbed absorption of minerals, particularly the calcium and phosphorus from GI tract in infected animals (Rajguru *et al*., 2001; Sheikh *et al*., 2005).

From the study, it is concluded that the trichostrongylosis is a chronic endoparasitic disease of goats causing diarrhea, anorexia, weakness, emaciation, and loss of body weight in

Table 3: Serum biochemistry parameters (Mean ± SE) in healthy and trichostrongylosis infected goats

Sr. No.	*Parameter*	*Healthy goats (n = 8)*	*Infected goats (n = 48)*
1	ALT (IU/L)	26.63 ± 0.78	52.58 ± 0.90**
2	AST (IU/L)	52.00 ± 1.26	101.43 ± 0.63**
3	Alkaline phosphatase (IU/L)	95.71 ± 1.34	194.89 ± 1.54**
4	Total protein (g/dL)	06.82 ± 0.18	05.65 ± 0.07**
5	Calcium (mg/dL)	10.28 ± 0.08	08.72 ± 0.07**
6	Phosphorus (mg/dL)	04.73 ± 0.15	04.28 ± 0.03*

**p <0.01, *p <0.05.

an affected flock. It causes a significant decrease in the mean Hb, TEC, PCV, lymphocytes as well as serum total protein, calcium and phosphorus, and increase in TLC, neutrophils, eosinophils, ALT, AST and ALP in infected goats. Regular deworming with alternative drugs can protect goats from the threat of trichostrongylosis.

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