



Original Research

Kid Coccidiosis and Associated Hemato-Biochemical Changes in Tarai Region of Uttarakhand

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Rec. Date:	Sep 11, 2018 08:38
Accept Date:	Apr 23, 2019 09:28
DOI	10.5455/ijlr.20180911083805

Abstract

The morbidity and mortality of kids is one of the major problems and an important constraint to profitable goat farming. Coccidiosis is one of the significant diseases, which accounts for anemia and associated with problems like decreased appetite, poor growth rate, decreased resistance to infections, and high mortality in kids. The present study reveals the alterations in hemato-biochemical parameters in kids naturally infected with *Coccidia*. Blood parameters like hemoglobin, PCV and TLC showed a significant reduction where as an increase in TLC was recorded as compared to healthy kids. Serum glucose, total protein, albumin, sodium, calcium and phosphorus were significantly ($P \leq 0.05$) decreased whereas BUN, creatinine, AST and ALT of diseased kids were significantly ($P \leq 0.05$) increased in comparison to healthy kids. Alterations in hematological and biochemical parameters should be taken into consideration while selecting the therapeutic regimen in order to reduce severity and hasten recovery.

Key words: Coccidiosis, Clinical Signs, Hematology, Kids, Serum Biochemical Parameters

How to cite: Ilyas, W., Singh, J., Prasad, A., Khan, S., & Singh, A. (2019). Kid Coccidiosis and Associated Hemato-Biochemical Changes in Tarai Region of Uttarakhand. International Journal of Livestock Research, 9(6), 123-129. doi: 10.5455/ijlr.20180911083805

Introduction

Coccidiosis is regarded as most common and economically important protozoan disease due to its considerable morbidity and mortality among kids, thereby causing great losses to goat industry (Yadav *et al.*, 2007). Majority of losses in coccidiosis are due to clinical disease (enteritis) and sub clinical infection (poor weight gain). It occurs mostly during 4–8 weeks of age (Taylor, 2009). Parasitic species belonging to genus *Eimeria*, family Eimeriidae and class Sporozoasida are responsible for the infection. *Eimeria ninakohlyakimovae* and *Eimeria arloingi* are the commonly occurring species in goats (Andrews, 2013). *E. parva* and *E. fauri* were the other species reported in Jammu region by Asif *et al.* (2012). Ingestion of massive dose of sporulated oocysts from the highly infected environment or a



significant asexual multiplication in the host, in relation to a lowered resistance of the host lead to coccidiosis. In addition, poor housing conditions or pasturing of animals (congestion, damp floor, muddy areas) pre-dispose to massive contamination of the environment and high infection pressure (Cai and Bai, 2009). Clinically the disease manifests as weight loss, anorexia, listlessness, weakness, abdominal pain, tenesmus, and yellowish or hemorrhagic diarrhea (Smith and Shearman, 2012).

A vast literature regarding alterations in hematological and biochemical parameters in naturally as well as experimentally infected sheep has been reported (Rama *et al.*, 1978; Hayat *et al.*, 1990; Ghanem and Abd El-Raof, 2005) but comparatively scarce literature is available in goats. Although Hashemnia *et al.* (2012); Rakhshandehroo *et al.* (2013) reported alterations in hemato-biochemical parameters in experimentally infected goats, there are no reports of effect of natural infection on the hemato-biochemical parameters. The prior knowledge of alteration in hematological and biochemical profile assists in therapeutic management of infected kids to reduce the severity by supplying exogenously the necessary minerals to combat the loss. In addition, estimation of the values of these profiles are the indicators of the severity of infection. So owing to the scarcity of current investigation, following study was undertaken to study the pattern of alterations in hemato-biochemical parameters in naturally infected goat kids with coccidiosis.

Materials and Methods

This study was undertaken on kids brought to Teaching Veterinary Clinical Complex (TVCC), GBPUAT, Pantnagar for treatment purpose and also farm kids of adjoining areas. Two groups (group A and B) each comprising of 32 kids up to 3 months age group were selected for the present study. Group A consisted of healthy kids and hence served as control. Group B consists of kids, which were suffering from coccidiosis. Fecal samples were directly collected from rectum and were screened for Coccidial oocysts under microscope. The blood samples were collected from jugular vein in vacutainers containing EDTA (@ 1mg/ml) for hematological analysis and in vacutainers without anticoagulant for biochemical analysis. The sera was harvested by allowing blood to clot for 1-2 hours and then centrifuged at 3000 rpm for 5 minutes. Hematological analysis including total erythrocyte count (TEC), hemoglobin (Hb), packed cell volume (PCV), total leukocyte count (TLC) and differential leukocyte count (DLC) (Giemsa stain) were undertaken by standard routine techniques. Biochemical analysis including blood urea nitrogen (BUN), creatinine, serum total protein (TP), serum albumin, serum alanine aminotransferase (ALT), serum aspartate aminotransferase (AST), serum sodium, serum calcium and serum phosphorus were calculated by using diagnostic kits provided by Erba diagnostics (Mannheim GmbH Mallaustr., 69-73, D- 68219, Mannheim/Germany) as per manufacturer's instructions.

Statistical Analysis

All data were represented by the mean \pm standard error (SE). All pair wise comparison of infected kids to control was analyzed by one way analysis of variance (ANOVA) using a statistical software for data (STPR43). Unless otherwise indicated, all differences were considered statistically significant at $P < 0.05$.

Result and Discussion

Caprine coccidiosis is one of the important parasitic diseases frequently reported in kids (Chhabra and Pandey, 1991). A complex interaction between parasite, host, and other factors like degree of stress, age, and immune status depicts the severity of the disease. All the kids in-group B were suffering from anorexia, diarrhea which was initially pasty later on becomes mucoid and in some cases hemorrhagic, weight loss, dullness and emaciation as shown in Fig. 1. The fecal samples were positive for coccidial oocysts as viewed under microscope.



Fig. 1: Diarrhea in kids suffering from Coccidiosis

In general, hematological and serum levels of most investigated parameters of diseased kids differed more or less distinctly from the healthy ones. The Mean \pm SE of different hematological parameters of healthy and diseased groups are shown in Table 1.

Table 1: Mean \pm SE of different hematological parameters of healthy and diseased kids

Parameters	Healthy Group (N=32)	Diseased Group (N=32)
Hemoglobin	10.80 \pm 0.32	7.27 \pm 0.45 ^a
PCV	32.3 \pm 1.13	26.75 \pm 0.65 ^a
TEC	13.88 \pm 0.51	7.32 \pm 0.28 ^a
TLC	12.16 \pm 0.49	18.43 \pm 0.48 ^a
Neutrophil	36.62 \pm 0.94	53.50 \pm 1.03 ^a
Lymphocyte	53.75 \pm 1.29	34.62 \pm 0.82 ^a
Eosinophils	5.25 \pm 0.61	9.37 \pm 0.53 ^a

Values bearing superscript "a" show a significant difference in a row ($P \leq 0.05$)

Hemoglobin, PCV and TEC of diseased group show a significant ($P \leq 0.05$) decrease as compared with healthy group. A significant ($P \leq 0.05$) leukocytosis was observed with neutrophilia, eosinophilia and

lymphopenia. The current findings of reduction in hemoglobin are in association with Anumol *et al.* (2012) in kids and Oyewusi *et al.* (2015) in lambs but in contradiction with Hashemnia *et al.* (2014) who reported a non-significant increase in hemoglobin ($P \leq 0.05$) in kids suffering from coccidiosis. Decrease in hemogram in the present study was due to hemorrhagic diarrhea found in diseased kids. Leukocytosis could have occurred due to inflammatory response to secondary bacterial infection and are in association with Hashemnia *et al.* (2014) who also reported a significant leukocytosis in coccidial infected kids where as in contradiction to Oyewusi *et al.* (2015). Rakhshandehroo *et al.* (2013) also reported a significant ($P \leq 0.05$) neutrophilia in goats infected with *Coccidia*. Ruiz *et al.* (2013) reported a significant ($P \leq 0.05$) eosinophilia in 7 weeks kids infected with *Eimeria*. Increase in eosinophil count is seen in parasitic conditions and in present study. Inflammation in the intestine is a common finding in both mammalian and avian coccidiosis, accompanied by structural and physiological changes which are deleterious to parasite development (Wakelin and Rose, 1990). During the digestion of particulate matter and debris of parasites as a part of phagocytic activity of cell mediated immune response leads to increase in neutrophilic and eosinophilic count as was found in the present study. The Mean \pm SE of biochemical parameters are presented in Table 2. Serum protein level of diseased kids was significantly ($P \leq 0.05$) decreased than healthy kids.

Table 2: Mean \pm SE of different serum biochemical parameters of healthy and diseased kids

Parameters	Healthy Group (N=32)	Diseased Group (N=32)
Serum total Protein (g/dl)	6.71 \pm 0.05	5.85 \pm 0.04 ^a
Serum Albumin (g/dl)	2.51 \pm 0.09	2.0 \pm 0.06 ^a
Creatinine (mg/dl)	1.32 \pm 0.08	1.77 \pm 0.04 ^a
Blood urea nitrogen (mg/dl)	22.25 \pm 1.75	31.0 \pm 1.63 ^a
Serum Glucose (mg/dl)	54.3 \pm 2.84	44.5 \pm 1.42 ^a
Serum Sodium (mEq/l)	143.8 \pm 2.88	127.3 \pm 0.99 ^a
Serum Calcium (mg/dl)	9.32 \pm 0.157	8.46 \pm 0.09 ^a
Serum Phosphorus (mg/dl)	6.07 \pm 0.60	4.87 \pm 0.33 ^a
Serum AST (U/L)	349.5 \pm 33.58	447.0 \pm 13.69 ^a
Serum ALT (U/L)	12.87 \pm 1.70	19.0 \pm 0.92 ^a

Values bearing superscript "a" show a significant difference within a row ($P \leq 0.05$)

In addition, a significant albuminemia was also observed. Hypoproteinemia might be attributed to protein losing enteropathy through the damaged mucosa caused by *Coccidia*. This is in agreement with Ghanem *et al.* (2008) who also reported a significant ($P \leq 0.05$) decrease in protein value whereas no significant ($P \leq 0.05$) difference was reported by Hashemnia *et al.* (2014). In addition, diarrhea is assumed to cause protein loss, which leads to hypoproteinemia. Albumin loss is predominant due to its smaller size and higher osmotic sensitivity to fluid movement (Ahmed *et al.*, 2015). The concentration of albumin decreases in chronic infections as this is a type of acute phase protein. In contrast, to present finding Dai *et al.* (2006) reported no change in albumin level in *Coccidia* infected kids. Increase in BUN and creatinine might be

due to anorexia, which causes less feed intake, and hence increase catabolism of body tissues leading to increase production of BUN and creatinine. Our findings are in contradiction to Mathews (2016) and Ahmed *et al.* (2015) who reported a significant ($P \leq 0.05$) decrease in creatinine value in goats suffering from coccidiosis whereas Anumol *et al.* (2012) reported no significant ($P \leq 0.05$) change in BUN values in goats suffering from coccidiosis.

Mean values of glucose, sodium, calcium, and phosphorus in infected kids also showed a significant decrease than healthy kids. Hypoglycemia in present finding might be due to anorexia and decreased absorption in intestine due to enteritis. Decreased sodium levels may be due to diarrhea and less absorption of sodium in intestine. This is in agreement with Hashemnia *et al.* (2014) who reported a significant decrease in sodium value in kids suffering from diarrhea. Shommein and Osman (1980) also reported a decrease in calcium level in goats infected with *Coccidia*. In addition, Davood and Kojouri (2015) reported a significant ($P \leq 0.05$) decrease in phosphorus level in coccidiosis infected sheep. Reduction in serum mineral values is mainly due to the diarrhea associated with coccidiosis, which lead to loss of these ions from the body. Nath (2014) and Kumar *et al.* (2005) who reported a significant ($P \leq 0.05$) decrease in glucose level in infected kids very well support our findings. The mean values of serum AST and ALT show a significant ($P \leq 0.05$) increase in infected kids than healthy kids, which is in agreement with Sabev and Parvanova (2008); Ghanem and Abd El-Raof (2005). Contradictory results were reported by Hashemnia *et al.* (2014); Dai *et al.* (2006) and Kumar *et al.* (2005) with no significant changes in AST and ALT values. Increased AST values in present study might be due to damage of liver by toxins produced during coccidial infection. Although AST is not liver specific in goats and is found in most of the body organs, its increased level is associated with muscle or liver damage. It is clear that coccidiosis affected kids showed a reduced growth and development hence suitable preventive measures by improving managerial practice and early treatment to avoid severity is required to control the disease.

Conclusion

The study confirms that coccidiosis has a significant effect on the hemato-biochemical parameters and hence can be used as a suitable indicator in caprine coccidiosis. Also, preventive measures will be taken by supplying essential supplements to reduce severity.

Acknowledgement

The authors are thankful to the Department of Veterinary Medicine, College of Veterinary and Animal Science, GBPUAT, Pantnagar for their assistance to undertake this work. Authors are also highly thankful to AICRP on Uttarakhand Goat, unit code, 189 for providing financial assistance and timely support.

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