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Measurement of hematological and biochemical parameters in sheep infected with intestinal protozoa and helminthes

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ABSTRACT

Fifty blood samples were collected from sheep of different regions in Salah Al-Din Governorate for the period from November 2019 to April 2020 to detect some hematological and biochemical criteria and the infection with intestinal protozoa (*Eimeria*, *Cryptosporidium*) and helminthes (*Marshallagia* sp, *Trichostrongylus* sp, *Ostertagia* sp, *Haemonchus* sp, *Chabertia* sp, *Nematodirus* sp, *Toxocara* sp, *Cooperia* sp, *Oesophagostomum* sp, *Strongyloid* sp).

The results of the study showed that the infection with intestinal protozoa and nematodes in sheep had an effect on the hematological parameters, as there was a significant decrease in the red blood cells (RBCs), volume of packed blood cells (PCV), lymphocytes compared to the control Groups reaching 4.9 ± 1.173 , $21.9 \pm 7.2 \pm 1.871$, 21.9 ± 2.881 , 45.1 ± 3.624 respectively.

While there was a significant increase in the number of white blood cells (WBCs) compared to the control groups reaching 13.2 ± 3.116 respectively.

Regarding biochemical parameters, there was a significant decrease in the concentration of protein and albumin, 5.308 ± 0.552 , 2.124 ± 0.372 respectively, as well as a significant decrease in the concentration of iron and calcium, 158.6 ± 34.4 , 8.73 ± 2.48 respectively, while no change in the concentration of magnesium and potassium was reported.

Introduction

The most common and important enteropathogens Coccidia in sheep are *Eimeria* and *Cryptosporidium* [1]. The main clinical signs of coccidiosis is diarrhea either watery or mucoid, often tinged with blood [2]. Intestinal protozoa is not only cause diarrhea but it can also causes other signs: anemia, dehydration, growth reduction and high morbidity [3].

Gastrointestinal nematodes are a zoonotic disease which develop within the digestive tract (abomasum, intestine) of small ruminant such as sheep which can cause anemia and reduced body weight [4].

Hematological changes associated with sheep intestinal protozoa and nematodes included a reduction in erythrocyte count (RBCs), packed cell volume (Pcv) and hemoglobin concentration (Hb) [5]. In addition, the disease associated with increase in number of leukocyte (WBCs) [6].

The serum biochemical profile shows some changes recorded with sheep intestinal protozoa and nematodes included a reduction in total protein and

albumin and a reduction in serum calcium, iron, potassium and magnesium [7].

Numerous species of intestinal protozoa and nematodes can produce variation in mineral concentrations in the blood of healthy sheep [8]. The decreased level of mineral which could be attributed to the bloody diarrhea associated with coccidiosis [9], while. The infection with nematodes such as *Haemonchus* can causes iron deficiency anemia and hypoproteinemia in the sheep [10]. This study was aimed to Measure of hematological and biochemical criteria in sheep infected with intestinal protozoa and nematodes.

Materials and methods

A total number of Fifteenth blood samples were collected from jugular vein and placed in EDTA tubes and transferred to the laboratory of veterinary collage under cold chain immediately. These samples divided in to two groups. Ten sheep's were clinically

healthy and free from gastrointestinal parasite and considered as control. The other fourteenth sheep's had bloody diarrhea and fecal analysis indicated the presences of intestinal protozoa and nematodes. Each sample divided in to two part, the first one used for estimation of blood picture (Red blood cells (RBCs) count, Hemoglobin (Hb) content, Lymphocytes and White blood cells (WBCs) count by using hemocytometer analyzer[11].

Serum from the second part was used for estimate (total protein, albumin, iron, calcium, magnesium and potassium) by using spectrophotometer [12].

Results:

Result showed a significant decrease ($P < 0.05$) of red blood cells a count (RBCs), hemoglobin (Hb), packed cell volume (Pcv) and lymphocytes in sheep infected with intestinal protozoa (*Eimeria*, *Cryptosporidium*) and nematodes, while there was a significant increase ($P < 0.01$) of white blood cells a count (WBCs) compared with a control group (table 1).

Table 1: The haematological parameters in sheep infected with intestinal protozoa and nematodes compared with control group

No	Haematological Parameter	Standard deviation $\pm$ Mean	
		Infected sheep	Control group
1	RBCs ($\times 10^6$ / μ L)	*4.9 $\pm$ 1.173	10.5 $\pm$ 2.430
2	Hb (g/dl)	7.2 $\pm$ 1.871*	$\pm$ 2.4029.5
3	Pcv%	$\pm$ 2.881*21.9	$\pm$ 3.19227.4
4	WBCs ($\times 10^3$ / μ L)	$\pm$ 3.116**13.2	$\pm$ 2.4439.4
5	Lymphocytes%	$\pm$ 3.624*45.1	$\pm$ 4.52352.5

*Significant different from control at $P < 0.05$

** Significant different from control at $P < 0.01$

Biochemical test demonstrated a significant decrease of total protein, albumin, iron and calcium concentration, while the results showed no change in the concentration of magnesium and potassium in comparing with control group (table 2).

Table 2: The biochemical parameters in sheep infected with intestinal protozoa and nematodes compared with control group

No	Biochemical parameters	Standard deviation $\pm$ Mean	
		Infected sheep	Control group
1	Total protein(g/dl)	$\pm$ 0.552**5.308	6.700 $\pm$ 0.593
2	Albumin(g/dl)	**2.124 $\pm$ 0.372	$\pm$ 0.2802.667
3	Iron(mg/dl)	$\pm$ 34.4*158.6	$\pm$ 16.8182.3
4	Calcium(mg/dl)	$\pm$ 2.48*8.73	$\pm$ 0.56112.150
5	Magnesium(mg/dl)	$\pm$ 0.3712.392	$\pm$ 0.2342.533
6	Potassium(mEq/L)	$\pm$ 0.4954.044	0.387 $\pm$ 4.317

*Significant different from control at $P < 0.05$

** Significant different from control at $P < 0.01$

Discussion

Protozoa (*Eimeria sp*, *Cryptosporidium sp*) and nematodes is an intestinal infection characterized clinically by diarrhea containing blood and mucus, inappetance and dehydration.

In the present study, the infected sheep with intestinal protozoa and nematodes demonstrated a significant

decrease ($P < 0.05$) of red blood cells a count (RBCs), hemoglobin (Hb), packed cell volume (Pcv) and lymphocytes, these result agreed with studies carried out in sheep infected with coccidiosis in Al-najaf province[13] and with [14] in Tikrit province are reported that intestinal parasite affected sheep's were having anemia and decreased in blood parameters.

Deghidry *etal* [15] found out that the infected sheep with intestinal protozoa and nematodes causes a significant decrease in total number of red blood cells and hemoglobin as a result of bleeding in the intestinal wall due to the infection with those intestinal parasites.

These finding disagree with [16, 17] in Egypt, which demonstrate a significant increase in size of red blood cells, hemoglobin and packed cell volume.

This difference may be attributed to the loss of epithelial cells and the effectiveness of the intestine to reduce its cells due to the weakness in the efficiency of absorption of the gastrointestinal tract, so that causing diarrhea, dehydration and anemia [13].

This result also showed a significant increase ($P < 0.01$) Of white blood cells a count (WBCs), these finding agreed with studies carried out in sheep in Egypt [17].

This is due to the role of white blood cells in the immune response and resistance to intestinal protozoa and nematodes leading to the occurrence of inflammation in the wall of stomach and intestine [6]. Biochemical serum analysis for sheep infected with intestinal protozoa and nematodes demonstrated a significant decrease of total protein, albumin, iron and calcium concentration, while the results showed no change in the concentration of magnesium and potassium, these results are identical with [13] in Al-najaf province and with [18] in Mosul province.

The decrease in these parameters might be attributed to suppression of appetite and decrease in absorption of food nutrient from infection site at intestinal mucosa due to damage and loss of surface epithelial cell and cell sloughing causing bloody diarrhea [19]. Mustafa and Yusuf [20] are reported that the decreased in serum iron and calcium in diarrheic calves would be caused by malabsorption and anorexia.

Conclusions

1- The infection with intestinal protozoa and nematodes in sheep had an effect on the haematological parameters, as there was significant decrease in the red blood cells, volume of packed blood cells.

2-The infection affects the concentration of protein and albumin, and the mineral element such as iron and calcium, and it can be considered an indicator for infection.

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قياس المعايير الدموية والكيموحيوية في الاغنام المصابة بالاولالي والديدان المعوية

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الملخص

(50) عينة دم من الاغنام من مناطق مختلفة من محافظة صلاح الدين والفترة من تشرين الثاني 2019 ولغاية نيسان 2020 وذلك لقياس بعض المعايير الدموية والكيموحيوية المصابة بالاولالي المعوية والديدان الاسطوانية *Marshallagia sp*, *Trichostrongylus sp*, *Ostertagia sp*, *Haemonchus sp*, *Chabertia sp*, *Nematodirus sp*, *Toxocara sp*, *Cooperia sp*, *Oesophagostomum sp*, *Strongyloid sp* أظهرت نتائج الدراسة أن الاصابة بالاولالي والديدان الاسطوانية في الضأن لها تأثير على المعايير الدموية إذ ظهر تناقص معنوي بكريات الدم الحمر وخضاب الدم وحجم خلايا الدم المرصوصة والخلايا اللمفية مقارنة مع مجموعة السيطرة إذ بلغت على التوالي 4.9 ± 1.173 , 7.2 ± 1.871 , 21.9 ± 2.881 , 45.1 ± 3.624 بينما سجل إرتفاع معنوي في عدد كريات الدم البيض مقارنة مع مجموعة السيطرة إذ بلغت 13.2 ± 3.116 . وفيما يخص المعايير الكيموحيوية أظهر إنخفاض معنوي بتركيز البروتين والالبومين إذ بلغ 2.124 ± 0.372 , 5.308 ± 0.552 على التوالي وكذلك انخفاض معنوي في تركيز الحديد والكالسيوم إذ بلغ 8.73 ± 2.48 , 158.6 ± 3.34 على التوالي بينما لم يسجل أي تغير في تركيز المغنيسيوم والبوتاسيوم.