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Effect of lice infestation on hematological parameters in goats

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Abstract

The present study was conducted to gather information on hematological alteration in lice infested goats of Kashmir valley. The study was conducted on 32 lice infested goats and 6 non infested healthy goats. The present study revealed that there was a significant decrease ($P<0.05$) in hemoglobin, packed cell volume and total erythrocytic count in infested goats when compared to healthy goats. The total leukocytic count was significantly increased ($P<0.05$) in the lice infested goats. The increased leukocytic count was associated with significant increase ($P<0.05$) in neutrophils, significant decrease ($P<0.05$) in lymphocytes and significant increase ($P<0.05$) in eosinophils. However there was no significant difference in mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC), Mean corpuscular hemoglobin (MCH) and monocytes between infested and non infested goats.

Keywords: Lice infestation, hematological parameters, infested healthy goats

1. Introduction

Ectoparasites including lice, ticks, mites etc. play an important role in the transmission of certain pathogens [1] but unfortunately they have not attracted proper attention of the veterinarians of our country. The ectoparasites are known to cause heavy economic losses to livestock industry due to their usual habit of blood sucking, which adversely affects the economic production [2]. Caprine pediculosis or lice infestation in goats is a serious problem among the goat flocks worldwide, especially during winter season [3]. Indian goats are commonly parasitized by two types of lice; chewing or biting lice (*Damalinia caprae*) and hematophagous sucking lice (*Linognathus africanus*) [4, 5, 6]. The major clinical manifestations of lice infestation in goats are attributed to the irritation and hypersensitivity reaction to the antigens present in the lice saliva. Severe chewing lice infestations induce alopecia, irritation, papulo-crustous dermatitis and self excoriation [5]. In human pediculosis, the antigens present in lice saliva induce severe hypersensitivity reaction and results in alterations in host biological system [7]. Like other ectoparasitic infections, lice infestations causes direct effect in terms of reduced quality of goat products like leather, mohair and meat, nutritional and metabolic containments and lowered production performance while as indirect effect includes the systemic changes [8, 9, 10, 11]. Therefore, the present study was aimed to hematological changes in lice infested goats.

2. Materials and Methods

2.1 Study Period and Study Area

The study was conducted on naturally lice infested animals at Mountain research centre for sheep and goat, Kashmir. A group of 32 cross bred goats naturally infested with lice and a group of 6 non-infested goats of similar age used as healthy control were included in the present study.

2.2 Methodology

Blood samples from both the groups were collected from jugular vein with the help of 18 "gauge sterilized needle in vials containing ethylenediamine tetra-acetic acid (EDTA) for estimation of the various hematological parameters [12].

2.3 Total erythrocyte count (TEC) (millions per μ l)

Total erythrocytes count (TEC) (RBCs) were estimated by hemocytometer, the red cells diluted using isotonic Hayem's solution [13].

2.4 Total leukocyte count (TLC) (thousands per μl)

Total leukocytes count (TLC) (WBCs), were estimated by hemocytometer using Turke's solution as diluting fluid^[14].

2.5 Hemoglobin level (mg/100 ml)

The hemoglobin concentration (Hb) was estimated by the acid hematin method (Sahli method)^[15].

2.6 Differential leukocytes count (DLC) (%)

It is the differential count of different leucocytes viz., Neutrophils, Lymphocytes, Monocytes and Eosinophils. All are expressed in percentage (%)^[14].

2.7 Packed Cell Volume (PCV)

The percentage of packed red cells in a given volume of blood after centrifugation is known as hematocrit. The packed cell volume (PCV), was estimated by Microhematocrit method using a capillary hematocrit tube approximately 7.5 cm in length and having a bore about 1 mm centrifuged in a micro hematocrit centrifuge^[16].

2.8 Mean Corpuscular/Cell Volume (MCV) (fl)

The mean cell volume is a measure of the volume of the average red cell in a sample. It is expressed in femtoliters (fl). It is calculated by the following formula^[16]: $\text{MCV (fl)} = \text{PCV} \times 10 / \text{RBCs count}$.

2.9 Mean Corpuscular Hemoglobin (MCH) (pg)

It is a measurement of the average amount of haemoglobin per cell. It is expressed in picograms per cell (pg/cell) and calculated by using the following formula^[16]: $\text{MCH (pg)} = \text{Hb} \times 10 / \text{RBCs}$

2.10 Mean Corpuscular Hemoglobin concentration

Concentration (MCHC) (%) It is a measure of the average concentration of haemoglobin per red blood cell. It is expressed in grams per deciliter (g/dL). It is calculated by the following formula^[16]: $\text{MCHC (\%)} = \text{Hb} / \text{PCV} \times 100$

2.11 Statistical analysis

The data generated was analyzed by students 't' test and all data is presented as mean \pm standard deviation. A p-value less than 0.05 is considered significant in all statistical analyses.

3. Results and Discussion

The mean hematological observation in lice infected animals and healthy control are given in Table 18. The hematological findings revealed differences between infested and control group of goats in all the blood parameters studied. There is a significant reduction ($P < 0.05$) in the hemoglobin (Hb) levels of infested goats (7.03 ± 0.43 g/dl) as compared to non-infested goats (9.21 ± 0.54 g/dl). It was also observed that the lower hemoglobin level in infested goats was accompanied by lower packed cell volume and erythrocyte count. A significant decrease ($P < 0.05$) in PCV and TEC was observed in infested goats ($23.83 \pm 1.93\%$, $5.12 \pm 0.21 \times 10^6/\mu\text{l}$, respectively) as compared to non-infested group of goats ($36.47 \pm 2.71\%$ and $6.94 \pm 0.37 \times 10^6/\mu\text{l}$ respectively). However, MCV, MCH and MCHC were not found to be significantly variable in the infested and non-infested goats. This may be attributed to the

normocytic normochromic anemia in the infested goats of the study area.

Our findings are in agreement with the findings of Ajith *et al*^[17] who found a significant decrease in hemoglobin and TEC levels in goats affected with lice infestation. The decreased hematological indices (Hb, PCV and TEC) recorded in the present observations could be attributed to the reduced appetite, blood loss from scratching and inflammatory response of the body due to these infections^[18]. It has been found that lice infestation cause increase in oxidative markers of blood^[17] and erythrocytes being very prone to oxidative damage can result in significant anemia in infested animals^[19]. Anemia in lice infected goats and attributed it to prolonged blood losses and loss of essential nutrients and oxidative stress which induce RBC damage and hence anemia^[17, 19]. Moreover, ectoparasites has been found to release some toxic substance which has been found to cause suppression of erythropoiesis and thus decrease in hemoglobin and^[19, 20]. Because of interference in feeding, many essential nutrients, especially minerals have been found to be deficient in affected animals^[21, 22]. In a report copper and zinc were found to be decreased in lice infested goats and both the minerals play an important part in erythropoiesis and could also be the cause of anemia found in the present study^[10].

TLC count revealed a significant increase ($13.19 \pm 1.35 \times 10^3/\mu\text{l}$) when compared to healthy control ($9.42 \pm 1.02 \times 10^3/\mu\text{l}$). The increased TLC was associated with neutrophilia ($49.83 \pm 3.02\%$), Lymphopenia ($36.25 \pm 2.58\%$), and eosinophilia ($10.54 \pm 0.72\%$) when compared to healthy control ($37.82 \pm 0.71\%$, $54.49 \pm 3.71\%$ and 5.94 ± 0.63 , respectively). No significant change was observed in monocytes.

Leukocytosis could be due to cellular and hormonal immune response in dermatitis^[17]. Many ectoparasites has been found to release the toxins which cause local inflammation and necrosis and thus predispose the animal to secondary bacterial infection^[23].

Neutrophilia and Lymphopenia observed in the present study could be attributed to immune suppression caused by lice infestation^[17] which makes animals prone to infections resulting in mobilization of marginal and bone marrow granulocytic pool^[24]. The leukocytosis associated with neutrophilia and lymphopenia could also be associated with decreased concentration of zinc and copper in lice infested animals^[10] because both the minerals play an important part in the immunity to infections.

Eosinophilia observed in the present study might be due to hypersensitivity reaction caused by lices and because of raised histamine concentration which causes release of eosinophils in the blood circulation^[25].

Ectoparasitic infestation in goats has also shown alterations in the blood parameters. In a study on goats in India, lower red blood cell count, packed cell volume, hemoglobin concentration and platelets counts in infested than non-infested ones was reported^[26]. The ectoparasites infestation has been found to affect the daily feed intake of animals because of continuous irritation and poor nutrition produces a fall in hematocrit and hemoglobin levels in any animal including goat^[27].

Table I: Hematological alteration in lice infested and non-infested goats

Parameters	Non infested goats	Lice infested goats
Hemoglobin	9.21 ± 0.54	7.03± 0.43*
Packed cell volume	36.47±2.71	23.83± 1.93*
Total erythrocyte count	6.94 ± 0.37	5.12± 0.21*
Total leukocyte count	9.42 ± 1.02	13.19 ± 1.35*
MCH	25.25 ± 3.82	29.50 ±3.19
MCHC	13.2 ±1.67	13.73±2.01
MCV	52.55±3.62	46.44 ±3.51
Differential leukocyte count		
Neutrophils	37.82 ± 1.48	49.83±3.02*
lymphocytes	54.49± 3.71	35.25± 2.58*
eosinophils	5.94 ± 0.74	10.54±0.72*
monocytes	1.75 ± 0.27	3.38± 0.16

The values along with rows having * differ significantly at $P < 0.05$

4. Conclusion

The results of the present study indicate that there was significant alterations in the hematological parameters of goats following lice infestation which should be kept in mind while treating lice infested goats.

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