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***Research Article** (Open Access)*

IMPACT OF PARASITISM ON BLOOD PROFILE OF SHEEP IN RESPONSE OF NATURAL INFECTION WITH GASTROINTESTINAL CESTODE (PLATYHELMINTHES) *STILESIA* (RAILLIET, 1893)

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ABSTRACT
The aim of this study was to analyse the possible relationships among the magnitude of gastrointestinal worm burden and the alteration of different blood parameters in sheep naturally infected with helminthic parasite *Stilesia* (Railliet, 1893).The total 66 animals were selected from local abattoir house for the study. The thirty five sheeps were naturally infected with parasites and thirty one were free from infection. Blood samples were collected from all animals for study of blood profile. The infected sheeps had lower RBCs, Hb, PCV, MCV, MCH and MCHC, whereas the total WBCs and differential leucocyte count had higher than the non-infected sheeps. With the parasitic worm burden the greater number of white blood cells ($t = \pm 0.22$; $P<0.01$), the higher number of WBCs in infected sheeps indicates the animal is most resistant to burden of *Stilesia* infection had greater cellular immune responses.

Keywords: *Blood Profile, Sheep, Stilesia, Platyhelminthes, WBCs Immune Response*

INTRODUCTION

Gastrointestinal parasitism is (GI) one of the greatest hazards and most important diseases in sheep production (Perry *et al.,* 2002), causing important losses by a decrease in the production and by the costs of control measures. The economic losses due to single or mixed helminthic infestations include mortality, growth retardation, lowered health condition and decrease meat production (Faiz, 1972). Gastrointestinal parasitic infestation is characterized clinically by enteritis, anemia, emaciation, dehydration and death (Sharma *et al.,* 2014) while subclinical infestation result in anemia, hypoproteinemia and hypoglycemia (Maiti *et al.,* 1999). Gastrointestinal parasitism is more common in tropical and subtropical regions of the world. Hematological analysis have been found to be a reliable indicator for assessing the animal health status and may give an assessment of the degree of damage of host tissues as well as severity of infection (Otesile *et al.,* 1991).

A number of helminthic infections are associated with gastrointestinal blood loss such as human hookworm infection, some parasites like *Diphyllobothridium latum* also cause red blood corpuscles count like *Pernicious anaemia* (Bonsddroff, 1956) and *Haemonochus contortus* infection in sheep. There is limited information of haematology in correlation with natural parasitic burden in sheep. Parasitic burden must be considered when assessing the physical conditions of host. It is obvious to expect alterations in the blood pictures as manifestation of the disease in host animals. Studies on the tapeworm infections in mammalian hosts have revealed that these helminth parasites, besides producing mechanical plus obstructive damages, produce a number of systemic disturbances as manifested by changes in the blood picture such as macrocytic anemia results from a deficiency of vitamin B12.

The objective was to determine whether hematological parameters in the whole blood varied significantly with the prevalence of gastrointestinal parasite *Stilesia* found among sheep.

MATERIALS AND METHODS

Present study was conducted at the Helminthology Research Laboratory of the Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University Aurangabad, (Maharashtra) India. Sixty-six sheeps with both sexes randomly selected for the collection of blood samples before slaughtering and the collection of intestines after slaughtered at local abattoir house. The methodology applied during this research work is given as below.

Parasitological investigation: The intestines of selected animals were collected after slaughtered and labelled properly with same identification number used for blood samples of sheep and immediately taken to the Helminthology Research Laboratory of the Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University for examinations. The intestines were dissected and open their contents and were washed in 2 litres of water thoroughly and examined for parasitic infection. From the infected intestines parasites were collected and preserved it for the further morphological study. Collected number of cestode parasites were recorded and identified after morphological study as *Stilesia Sp.*

Hematological analysis: The blood sample were collected on anticoagulant (EDTA, 1mg/5ml blood).Blood samples were taken from the jugular vein into evacuated EDTA tubes and stored at +4°C and samples were labelled with an identification number for estimation of different hematological parameters (Hb, PCV, RBCs and total WBCs count). Samples were analyzed within 12h. Total white blood cells (WBCs), red blood cells (RBCs) count were enumerated by Haemocytometer (Berkson, 1940). The packed cell volume (PCV) was estimated by Wintrobe method (Wintrobe, 1951) and the hemoglobin (Hb) estimation was done by Sahlis acid hematin method. Neutrophil, lymphocyte, monocyte and eosinophils were counted through smeared stained slide (Leshman's stain). The mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), and were calculated using statistical formulae.

$$\text{MCV} = \frac{\text{PCV}}{\text{RBCs in million/cubic mm}} \text{ X } 10$$

$$\text{MCH} = \frac{\text{Hb in gm/100 ml}}{\text{RBCs in million/cubic mm}} \text{ X } 10$$

$$\text{MCHC (In \%)} = \frac{\text{Hb in g/100 ml}}{\text{PCV}} \text{ X } 100$$

Statistical analysis: Data were analyzed using Statistical methods and results are expressed as means ± SD (standard deviation). Significance of difference between herds was determined by Student's t test.

RESULTS AND DISCUSSION

Hematological parameters of infected and non-infected sheep are summarized in Table 1. Significantly lower number of RBC, Hb, PCV, MCH, MCV and MCHC were recorded in the naturally infected sheep with parasite whereas WBC, lymphocytes, neutrophils, eosinophils, and monocytes were significantly higher than in the non-infected sheep.

Gastrointestinal parasitic infection cause direct and indirect losses in animals. Direct losses include acute illness and death, premature slaughter and rejection of some parts of meat at meat inspection. Indirect losses include decreased growth rate, weight loss in young growing animals and late maturity of slaughter stock (Hansen and Perry, 1994). In the hematological analysis, there was a significant reduction in Hb, total erythrocyte count and PCV values in infected animals as compared with non-infected ones, this may be attributed to effect of gastrointestinal parasite in decreasing the life span of RBCs and suppression of hemopiotic system (Kinne and Wernery, 1997) and may be due to acute loss of blood by suckling activity

and hemorrhages caused by various gastrointestinal parasites (Bhat *et al.*, 2004) .While there was a significant increase in total leucocytic count in infested sheep as compared with control ones, which may be caused by stimulation of lymphoid tissues and stem cells in the bone marrow by the parasites and their toxins (Maghaddar, 2002). Hematological analysis of blood collected from infested sheep were significant reduction in Hb, total erythrocyte count and PCV values, while there were a significant increase in total leucocytic count in infested sheep as compared with healthy control ones (Zeinab, 2018).

Table 1: Blood profile of sheep Non-infected and Infected with gastrointestinal cestode *Stilesia* (Railliet, 1893) (mean ± SD)

Blood Parameters	Non-infected Sheep (n=)	Infected Sheep (n=)
RBCs (10^6/ cmm)	11.7 ± 0.46	10.66 ± 0.46*
Hb %	11.27 ± 1.00	8.37 ± 0.71*
WBCS (10^3/ cmm)	7. 48 ± 0.18	8.45 ± 0.22**
PCV %	31.58 ± 2.15	27.17 ± 1.63*
MCV fl	27.06 ±2.41	25.55 ±2.09*
MCH Pg	9.6 ± 1.0	7.8 ± 0.6*
MCHC g/dl	35.67 ± 1.49	30.69 ± 2.60*
Neutrophil %	22. 7 ± 3.34	24.6 ± 3. 23**
Lymphocyte %	45.3 ± 3.57	48.3 ± 3.31**
Monocyte %	3.0 ± 1.61	4.7 ± 1.73**
Eosinophil %	4.2 ± 2.2	7.0 ± 5.36**

Data are expressed as mean ± S.D. Asterisk/s (*) indicate the presence of significant difference between groups * *P<0.05*, ** *P<0.01*. *SD* Standard deviation, *n* Size of sample

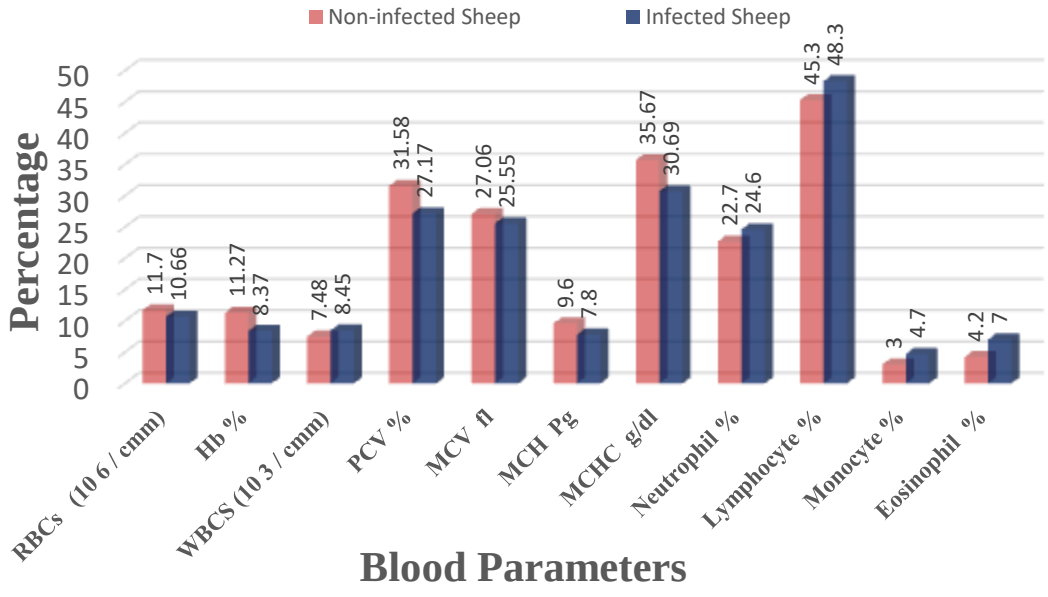

Figure 1: Graphical representation of different blood parameters of Non-infected and naturally infected sheep with gastrointestinal cestode *Stilesia* (Railliet, 1893)

In the present work, neutrophils and eosinophils were found increased in the infected sheep than the non-infected one, which could indicate that these sheep were more resistant to the parasitic infection. These results confirm those previously described by Wankhede *et al.*,(2007)**,** Shaikh Kalim *et al.*, (2012), and Bhure (2021) in Rat, Goat and Hen infected with Cestode parasites.

The cellular immunity is a part of the adaptive response of mammals and are actively involved in nematode infections (Miller and Horohov, 2006). The effects of nematode infection are closely related to the nutritional status of the host. It is known that well-fed animals may respond better to infection than those subjected to an inadequate diet (Bricarello *et al.*, 2005), Nematodes interfere with the ability of the host to utilize nutrients efficiently (Miller and Horohov, 2006), reducing the cellular immune response of these animals against parasitism. In our study, sheep that naturally infected with worm burdens shows decline of erythrocyte numbers and Hb% and increase in the number of blood immune cells which means had better cellular immune responses in infected sheep, which is making them able to coexist in equilibrium with parasitism of *Stilesia*.

CONCLUSION

It could be concluded that gastrointestinal parasitism cause significant impact on blood profile of sheep naturally infected with gastrointestinal tapeworm *Stilesia* (Railliet, 1893) and may cause economic losses due to poor performance of infested sheep including decreased growth rate, decreased productivity and reproductively which should managed by suitable gastrointestinal treatments. It is necessary to take adequate parasite control measures to ensure the health of these animals, forgoing results also suggest that there are a progressive changes in blood parameters like RBCs, Hb, PCV, MCV, MCH, MCHC decreases and WBCs. Neutrophils, Lymphocytes, Monocytes, Eosinophil count increases so these parameters are very important for diagnosis of diseases at the earliest possible. it can be said that the helminthic infections included in this study produce alteration in the haematological manifestation in different hosts of mammal, which are quite comparable to human being (Weinreb ,1956; Johnson *et.al.*, 1974)

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