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Effects of Fasciolosis on Haematological Parameters in Cattle

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ABSTRACT

Background: Bovine fascioliasis is a systemic infection of cattle caused by, *Fasciola spp*. The objective of this study was to investigate the effect of fasciolosis on hematological parameters in cattle.

Materials and Methods: In the present study, 40 local breeds (Watani) bulls and non-pregnant with ages ≥2 years heifers were randomly selected, of which 30 were infected with *Fasciola spp* and 10 were not infected (control).

Findings: These results indicated that the infected group had significantly lower total red blood cell (RBC) count and Haemoglobin (Hb) levels than in the control group. In contrast, the infected group had a higher total white blood cell (WBC) count (9.3 x10^3) compared to the not-infected group (7.7 x10^3).

Conclusion: The hematological findings of the present study suggest that *Fasciola spp* decreases the total RBC count and Hb levels, leading to anemia.

Keywords: Fasciolosis, RBC, WBS, Hb, and Cattle

INTRODUCTION

Fascioliasis is a systemic infection caused by *Fasciola spp*. in cattle, goats, and sheep that leads to economic losses by reducing production, production, and animal growth (Malone et al., 1998). According to a previous report, internal parasites annually affect the livestock industry by more than 2 billion USD by decreasing productivity (Axford et al., 2000). The liver fluke is among helminthic infections that decrease food intake and metabolism in infected cattle, leading to anemic conditions (Amarante, 2001; Keyyu et al., 2005; Muturi et al., 2005). *Fasciola spp*. has many negative effects on animal health, such as decreasing the total amount of blood in infected animals (Soun et al., 2006). Although the loss of blood is related to a load of mentioned parasites (Coop and Kryziakis, 2001; Wiedosari et al., 2006), both types of *Fasciola* (*F. hepatica* and F. *gigantica*) migrate through the liver tissues, leading to severe anemia (Wiedosari et al., 2006). Hematological parameters such as total RBC count, packed cell volume (PVC), Hb level, and differential count tests can provide a wide range of information for better diagnosis of diseases in cattle (Yokus and Cakir, 2006). Currently, little information is available on hematological changes induced by *Fasciola* through numerous hematological and biochemical changes associated with liver damage which had been indicated by a significant decline of total erythrocyte count (TEC), hemoglobin (Hb) level, packed cell volume (PCV) and mean corpuscular hemoglobin concentration (MCHC), the significant increase of erythrocyte sedimentation rate (ESR) and insignificant

alterations in the values of mean corpuscular volume (MCV) and mean corpuscular hemoglobin (MCH) content (Hammond and Sewell, 1974; Ogunrinade and Bomgboxe, 1980). None of the study has been conducted to determine the effects of *Fasciola* on the blood parameters of local breeds (Watani breed) in Afghanistan. Therefore, in this study, we investigated the effects of *Fasciola spp*. on the hematological parameters (RBCs, WBCs, and Hb) of local breeds. The results of the study may provide early warning signs in the detection of bovine *fasciolosis* and baseline data for future research in this local breed.

MATERIALS AND METHODS

Identification of animals and Study area:

This cross-sectional study was conducted on 40 local breed cattle, divided into two groups of males and females, each group divided into subgroups. Each subgroup contained 15 infected and 5 non-infected animals. The Female group animals were non-pregnant with ages ≥2 years. This study was conducted from the beginning of November 2016 to the end of June 2017 in the laboratory of the Pre-clinic department, Veterinary Science Faculty, Nangarhar University, and samples were collected from the cattle of the Bihsod district, Nangarhar province, Afghanistan.

The fecal samples collection for *Fasciola spp* determination:

Fecal samples were collected from the rectum of both male and female animals in sterilized plastic boxes and transported to the laboratory for microscopic examination using the sedimentation method, as previously described (Hansen and Perry, 1994).

Blood Samples collection:

Blood (5 ml) was collected from the Jugular vein of both infected and control animals using a 10 ml syringe with a 20-gauge needle and placed into the anticoagulant tube (EDTA) tubes. The samples were then mixed properly and analyzed within 12 hours to determine the hematological parameters, such as total RBC counts, and total WBC counts, using the hemocytometer (Neuberger's) counting method, as previously described (Cadena-Herrera et al., 2015). In addition, hemoglobin (Hb) values were estimated using the hemoglobinometer (Sahli, 1902).

Statistical Analysis

All the experimental data are shown as the mean ± SEM and analyzed by ANOVA followed by Post-test. The statistical level of significance was considered at $P<0.05$. The data were subjected to statistical analysis using SPPSS version 17 software.

RESULTS

In the present study, we investigated the effects of *Fasciolosis spp*. on hematological parameters in cattle, the results show that the total red blood cell (RBC) count in heifers and the bull was decreased compared to the non-infected group. Particularly in infected heifers were significantly decreased (6.8×10^6) than the non-infected group (8.4×10^6) ($p<0.05$). The total number of RBCs in heifers was lower than in bulls as shown in Figure 1. The levels of hemoglobin were also decreased in the infected groups of both bulls and heifers compared to the non-infected group (Figure 2). In contrast, the total of white blood cells (WBC) counts was significantly

increased in infected groups than non-infected groups. The bulls had greater total WBC count than the heifers as shown in Figure 3.

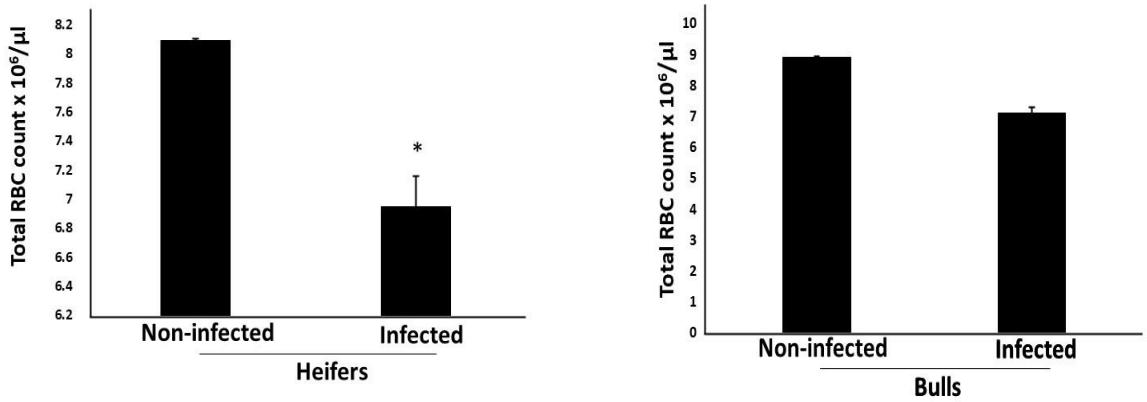

Figure 1. The total RBC count was decreased in infected cattle compared to the non-infected group, with a significant decrease observed in infected heifers compared to the non-infected group (p<0.05), the total RBC count was also lower in heifers than in bull. The (*) indicates a significant decrease in infected cattle.

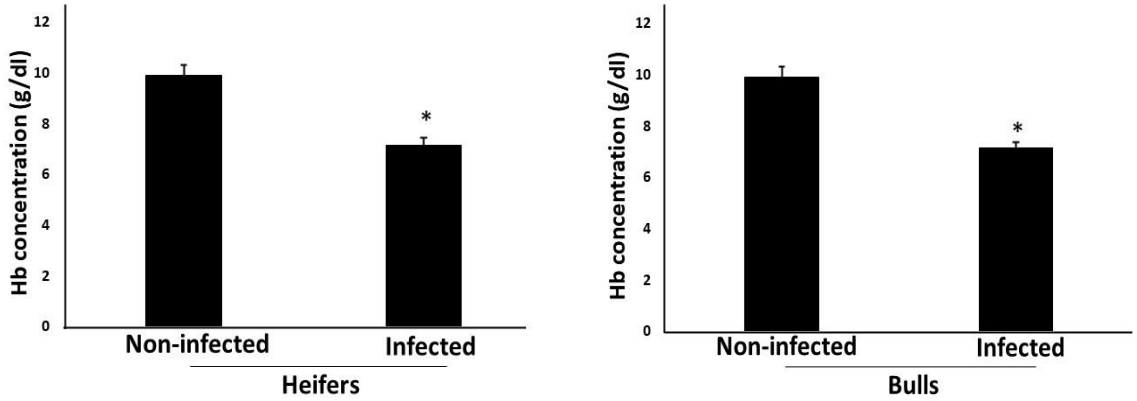

Figure 2. The levels of hemoglobin (Hb) in heifers and bulls were significantly decreased in the infected groups compared to the control groups (p<0.05). The decrease was more pronounced in infected heifers than in infected Bulls. The (*) indicates a significant decrease in infected cattle.

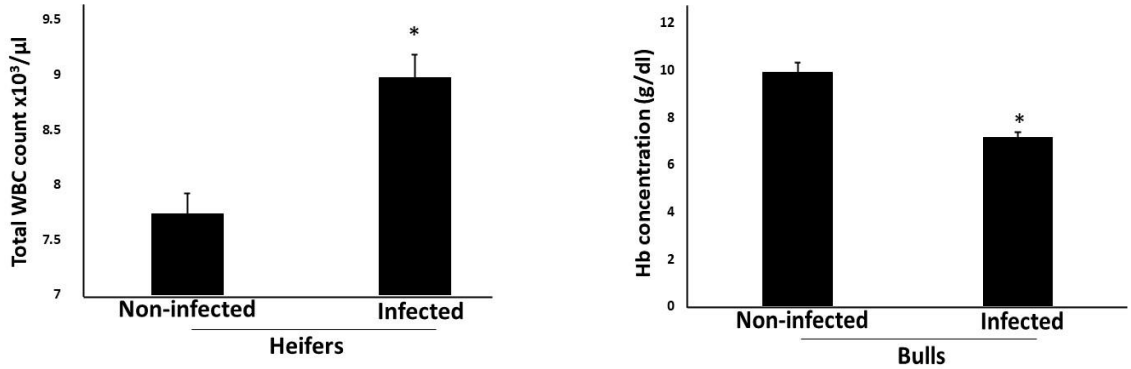

Figure 3. The total WBC count in heifers and bulls were significantly increased in infected heifers and bulls than the non-infected group. The (*) indicates a significant increase in infected cattle.

DISCUSSION

Fasciolosis is a worldwide disease in several species of mammalian, caused by *Fasciola spp*. (*F. hepatica and F. gigantica*) (Mas-Coma et al., 2019). It is generally accepted that in cattle only the chronic form of fascioliasis occurs (Soulsby, 1982). In the present study, we focused to identify the effect of fasciolosis on total RBCs, total WBCs counts, and Hb levels of cattle. This study showed that there was a significant decline in the total number of RBCs and Hb levels, whereas the total number of WBC significantly increased in the infected group compared to the non-infected group. Previous studies reported that the number of total RBCs significantly decreased in the infected group in cattle (Molina et al., 2006; Haroun and Hussein, 1975; Wahab et al., 2019 and Egbu et al., 2013) and in sheep (Doaa et al., 2007; Waweru et al., 1999; El-Aziz et al., 2002; Ahmed et al., 2006 and Matanović et al., 2007; Sykes et al., 1980). Our results of the present study are consistent with the above findings and support the concept that *Fasciola spp*. decreases the total number of RBCs in cattle.

In the present study, blood samples were collected from both *Fasciola spp*. infected and non-infected cattle to determine the effects of *Fasciola spp*. on Hb levels. Our study demonstrated that levels of Hb were significantly lower in the infected group compared to the control group. These results confirm and support the results of past conducted studies, which have shown a significant decline of Hb levels in cattle that were infected with *Fasciola spp*. (Leka et al., 2005; Doaa et al., 2007; Waweru et al., 1999; El-Aziz et al., 2002; Ahmed et al., 2006 and Matanović et al., 2007). Other studies that were conducted on sheep indicated that sheep infected with *Fasciola spp*. had lower Hb levels compared to those sheep which were free from *Fasciola spp*. (Sykes et al., 1980; Wahab et al., 2019 and Egbu et al., 2013). The reduction in the number of RBCs and levels of Hb may be attributed to acute anemia, which directly affects the production and reproduction of cattle.

Previous studies have been conducted to determine the effects of *Fasciola spp*. on the total number of WBCs in Holstein breed cattle. Their data demonstrated that there was a significantly higher total number of WBCs in *Fasciola spp*. The infected group compared to the control group (Egbu et al., 2013; Martinez-Valladares et al., 2010). In our current study, we examined the effects of *Fasciola spp.* in our local breed. Our data indicated that the total number of WBCs was significantly higher in the *Fasciola spp.* infected group. These results are in good agreement with the above-mentioned findings and strongly support their results. A previous study conducted in Lambs indicated that Females showed more significant increases in WBC counts than Males (Ljubičić et al., 2022). These findings suggest that *Fasciola spp*. causes deep changes in hematological parameters in cattle; decreasing the total number of RBCs and the levels of Hb in the blood, which lead the animal to an anemic condition. In contrast, increasing the total number of WBCs elevates the immune system to defend against infection.

CONCLUSION

The results of the present study indicate that *Fasciola spp*. has a significant impact on the hematological parameters of cattle, which can inhibit their growth and directly affect their production and reproduction. Further investigations are required to explore the effects of *Fasciola spp*. on remaining hematological parameters in cattle and to understand the underlying mechanisms involved. This will help the development of effective control strategies and management practices to minimize the impact of fasciolosis on the health and

productivity of cattle. The present study demonstrated that *Fasciola* affects the health of cattle and leads to anemic conditions; therefore we strongly suggest that farmers deworm their cattle against the parasites.

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CONFLICT OF INTEREST

All authors express no conflict of interest in any part of the research.

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