

Research article

Impact of Fascioliasis on circulating physiological biomarkers of stress and inflammation in cattle

Shaimaa Abbas Sabeeh Esraa Taher Muslim Asseel A. Saeed

College of Veterinary Medicine, University of Al-Qadisiyah, Iraq

Corresponding Author Shaimaa.sabeh@qu.edu.iq

Co-Author Emails esraa.taher@qu.edu.iq Assel.saeed@qu.edu.iq

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Abstract

*This study was conducted for verifying the effect of liver worm sickness (Fascioliasis) on the general health of the animal, The hematocrits levels, (RBCs) count, Haemoglobin concentration (Hb) and packed cell volume (PCV) were also determined in the two groups of beef infected and non-infected with Fascioliasis the inflammatory parameter in liver :glutamic oxaloacetic transaminase (GOT) and glutamate pyruvate transaminase(GPT) were determined in the beef with moderate Fascioliasis and The results of this study were compared between infected animals and non-infected animals. A few have been taken oxidative stress: Superoxide Dismutase (SOD), Glutathione (GSH), Malondialdehyde (MDA) and catalase enzyme (CAT). In both, groups there were some a significant contrasts in the levels of GSH, MDA, SOD, CAT and GOT, GPT. For CAT there was a significantly accelerated in its levels in the infected beef in comparison with the non-infection beef. While GSH and MDA there was a decrease in the level of GSH and an accelerated in the level of MDA in compared to non-infected beef respectively. SOD activity was decreased in blood serum of infected beef comparison with non-infected. The findings showed the beef infected with *F. spp.* were under oxidative stress. In inflammatory parameters were some significant differences in the levels of (GOT, GPT), its showed accelerated in levels with infected animals and normally in non-infected animals. This research reinforces that animals infected with trematodes, which may have effects on the overall health of animals, will be under oxidative stress and inflammation.*

Keywords: CAT, Fascioliasis, GSH, GOT, GPT, MDA, SOD.

Introduction

One of most economically important parasitic diseases of ruminant caused by trematodes is Fascioliasis which caused by genus *Fasciola* commonly referred to as liver fluke, *F. hepatica* and *F. gigantica* are the two species most commonly implicate as the etiological agents of the fascioliasis. *F. hepatica* has a worldwide distribution while *F. gigantica* is found on most continents primarily in tropical region. *Fasciola hepatica*, the common liver fluke, causes Fascioliasis; it may lead to secondary

bacterial infection such as bacillary ictero-hemoglobinuria red water in beef. Members of the genus *Clostridium* cause this disease, anaerobic spore forming bacteria (1). This fluke passes its life cycle in two various hosts: those are definite hosts Definitive hosts and intermediate (DH). Include cattle, sheep. Many other ruminants, equidae, swine and rabbits. The genus *Lymnaea* in general; and *L. truncatula* and *L. auricularia* in particular are the most common intermediate hosts for *these* parasites respectively. These

intermediate hosts serve as means of transmission to animals, that the animal gain accesses their infective stage by feed and water intake (2) Pathogenesis of Fascioliasis changes according to the parasitic progression phases: parenchymal and biliary phases. The parenchymal phase occurs within migration of flukes through the liver parenchyma leading to liver damage and hemorrhage. The biliary phase synchronize with residence of parasite in the bile ducts and results from the haematophagic activity of the adult flukes and from the damage in mucosa of bile duct by their circular spines (3). Fascioliasis occurs when the parasite invades the hepatic bile duct (4), and Animal become have pale eye and gums which typically developed to "bottle jaw" due to edema beneath the jaw (5). The diagnosis of Fascioliasis can be based on several factors clinical signs history, seasonal occurrence, and examination of grazing by laboratory tests and post mortem examination. (2). The drugs have been used to control Fascioliasis in animals and its differ in their efficacy, mode of active and cost .the most common one Triclabendazole its considered as treatment of choice due to its effectiveness for both the larva and adult flukes but, the main control mode are reduction of snail population, use of anthelmintic and immunization and immunity (6). Fascioliasis considered as important economic diseases throughout the world, which causes very important losses like high morbidity, mortality, reduced growth rate and condemnation of liver accelerated susceptibility to secondary infections and expense due to control and treatment (7).

Results

Hematological parameters

There were a significant differences in the value of red blood cells, hemoglobin and cell size Table (1). There was a significant decrease in the value of these standards

Materials and Methods

Ethical approval

The Animal Ethical Committee of Veterinary Medicine College, University of Al-Qadisiyah, Iraq, has approved the present study under permission No: 404

Samples collection

Blood and liver samples collection from affected cows in Abattoirs were taken to hematological and biochemical analysis. These samples transported and chilled at -20° C to the laboratory where to -72°C until the time of use. The red blood cell count (RBC), packed cell volume (PCV) and Haemoglobin concentration were determined by using automated haematology analyser

GOT and GPT

Are determinate by Eliza kits from US bio USA.

Antioxidants profile

Catalase (CAT) Assay

The catalase activity was measured by using spectrophotometric, according on the method described by Claiborne (8).

Superoxide Dismutase (SOD)

Depending on the way described by Sun *et al* (9). The activity of SOD was measured.

Glutathione (GSH)

The determination of GSH .According to the method described by Cohn and Lyle (8)

Malondialdehyde (MDA)

By using the Thiobarbituric acid (TBA) method of (21).

where the results show that there is a significant decrease in blood standards of infected animals by *F. spp* compared to non-infected animals due to of decreased amounts of RBCs in the infected animals.

Table (1): Hematological parameters, which were measured in the blood samples of infection and non-infection animals with *F. spp.* The values means \pm SD of the 54 non-infected beef and 18 beef infected with *F. spp.*

Hematological Parameters	Non-infection Animals (n= 54)	Infection Animals (n= 18)
RBCs ($\times 10^6/\mu\text{l}$)	7.21 \pm 0.19*	6.85 \pm 0.33*
PCV	37.14 \pm 0.43***	35.38 \pm 1.05***
HB Conc. (g/dL)	11.09 \pm 0.35***	10.41 \pm 0.26***

* Significantly variance between each other at $P \leq 0.005$ (t-test).

*** Significantly variance between each other at $P \leq 0.001$ (t-test).

GOT & GPT Serum concentration

The results showed significant differences between groups infected and non-infected. In-group infected has been high value of these enzymes in blood serum while in-group non-infected has been normal value of this in enzymes in blood serum. This indicated to effect of Fascioliasis on liver functions Table (2).

Table (2): liver enzymes, the values means \pm SD of the 54 non-infected beef and 18 beef infected with *F. spp.*

enzymes	Non-infection Animals (n= 54)	Infection Animals (n= 18)
GOT	7.23 \pm 0.19*	6.85 \pm 0.35*
GPT	37.13 \pm 0.44***	35.39 \pm 1.05***

* Significantly variance between each other at $P \leq 0.005$ (t-test).

*** Significantly variance between each other at $P \leq 0.001$ (t-test).

Oxidation-Antioxidation parameters

Table (3) shows that activity of SOD in animals infected with *F. spp.* is significantly lower than that of healthy animals. Due to oxidative stress in the superglu of the H₂ and the production. Which lead to irregular of the production of superoxide and H₂. Leading to irregular production of superfluid's and H₂. The results obtained predicted that the decomposition of the superoxide would be low due to lower SOD

Discussion

Some alterations or adjustments in Biochemical markers was considered an indicator of the physiological condition of an animal. Hematological parameters, RBCs Count, PCV and HB concentration were used as indicators of animal health. The findings

levels, resulting in corresponding low H₂O₂ pulses being produced or created. The results were a significant increase ($P < 0.001$) in the effectiveness of the catalase enzyme and the efficacy of both Glutathione and Malondialdehyde in infected animals compared to non-infected animals. The results also showed that beef infection with trematodes *F. spp.* causes high levels of MDA as a final product of peroxidative decomposition of polygenic fatty acids in the lipid peroxidation process.

Table (3): oxidation-antioxidation parameters, the values means \pm SD of the 54 non-infection beef and 18 beef infection with *F. spp.*

oxidation-antioxidation parameters	Non-infection Animals (n= 54)	Infection Animals (n= 18)
SOD	1.45 \pm 0.03* U/ml	1.04 \pm 0.03*** U/ml
GSH	177 \pm 0.3* U/ml	210 \pm 0.5*** U/ml
CAT	51 \pm 0.1* U/ml	63 \pm 0.3*** U/ml
MDA	40 \pm 0.2* mol/g	130 \pm 0.1*** mol/g

* There was significantly variance between each other at $P \leq 0.005$ (t-test).

*** There was significantly variance between each other at $P \leq 0.001$ (t-test).

showed RBC, PCV and hemoglobin levels were significantly decrease in infected group as compared to the healthy group. The decrease in levels of PCV and hemoglobin levels was because of reducing in account of RBCs in the infected animals. These results

due to abnormal hepatic function and anemia, and came more agreement with more findings observed in Fascioliasis reported in of studies (9, 0) changes in activities of Liver enzymes as markers of liver damage had been recognized in several species of ruminants (11). Levels of these enzymes like CAT, GSH peroxidase and SOD accompanied with levels of compounds like GSH and MDA were used in determination of oxidative stress in those animals. Many studies (12, 13) reported that abnormal changes in liver function are characteristic traits of *F. spp.* because these worms depend on host blood in the chronic phase of the disease and there is leakage of protein through the bile duct epithelium of the host (14). The increased in plasma turnover rate and decrease in the concentration of plasma iron leads to a continuous loss of iron in the bowel which lead to iron deficiency anemia (15, 16). results of GOT & GPT enzymes were acceralated in blood serum in infected animals while in non-infected animals was normal value This was considered as a indicate to this disease effected on the liver function, and the parasite caused damage of live tissues that's effected directly on liver function and its enzymes, when the number of flukes in the liver parenchyma acceralated. The value of alanine aminotransferase (GPT), aspartate aminotransferase (GOT) showed a declining trend line. Because of damage, this disease caused heavy economic losses in livestock, due to causing a negative effect on production, causing weight loss (18). The confiscation of liver (19, 20). Also in reproductive efficiency, and milk production loss (21). However, this unexpected result; came consistently with the result obtained by (22). Which showed a decline in levels of SOD. The reason might be that various antioxidant enzymes had been expressed relying upon the milieu of harmful

SOD created and various cytokines. These results came similar to, (23) which his study confirm an increase in liver catalase activity in rats infected with Fascioliasis. The altitude in production of GSH peroxidase enzyme represents an adaptive change against potential liver damage, appearance the liver's ability to scavenge increase of SOD. (24). the activity of GSH peroxidase in animals infected with trematodes had been carried out on Several studies, which were showed a decrease in the levels of the liver enzyme in rat infected by *F. hepatica*; and acceralated liver GSH peroxidase activity in sheep's infected with nematodes and *F. spp.* respectively (25, 26).while in this study the activity of GSH peroxidase was significantly acceralated also in the infected beef as compared to the healthy beef. High levels of ROS in infected animals resulted from damage during invasion and penetration of *F. spp.* tissue or because of parasitic metabolism products. This can lead to increasing in GSH peroxidase activity might have been caused by the acceralated GSH peroxidase levels are consistent with (27, 28). Showed significantly reduced in the levels of GSH compared with non-effected animals. While (29) who described the oxidative stress in the liver of infected rats with *F. spp.* where he observed that, there was an increase in lipid peroxidation? In other comparable studies, it was found that the parasite invasion of *F. spp.* liver can cause growth to free radical-mediated and leads to oxidative stress as a response to phagocytosis. As a major cause in the initiation and evolution of lipid peroxide and high levels of accelerated MDA levels in the liver (30). The results of this work confirm that animals infected with liver fluke can affect the overall health of the animal, as the animals suffer from oxidative stress.

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