Studies of Naturally Infected Babesiosis and its Effect on some Hematological and Biochemical Parameters in Cattle in Qena, Egypt

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Abstracts

In the present study, 40 Egyptian cattle infected with babesiosis and 10 healthy (as control) were used as animal material. Haematological findings that were observed with domestic animals in connection with blood parasite infections are very essential. In this study it was demonstrated that value of haematological parameters of the group, compromising infected animals, were relatively lower compared to control group parameters he infected animal showing decrease in Rbc’s counts, Wbc’s counts and increase in phosphorus, decrease in calcium. Serum level of aspartate aminotransferase (AST) showed significant increase in babesiosis, while the Serum level of alanine (ALT) was significantly increased in A babesiosis. Serum level of iron and copper suffered from babesiosis showed significant increase of both iron and copper serum levels.

The aim of this study was to ascertain the effect of babesiosis on haematological parameters and several mineral levels.

Keywords: cattle, Babesia ovis, hematology, Mineral substances
Introduction

Babesiosis is a protozoan disease, which is generally characterized with high fever (40-41°C), anorexia, weight loss, ruminal atony, dyspnoe, red water urine (haemoglobinuria) and jaundice, of sheep, goat, cattle, horse, dog, and cats. Emaciation, anemia, various degrees of jaundice (icterus) from paleness in mild cases to severe yellow discoloration of conjunctival and vaginal mucous membranes in more progress cases., The vector places itself in animal’s erythrocytes and Babesia forms can vary as pear-shaped, round and elongated.

The most common species that causes infection on cattle are in Egypt. babesia bigemina, babesia divergens, babesia bovis babesia major. Two species, B. bigemina and B. bovis, have a considerable impact on cattle health and productivity in tropical and subtropical countries (Iseki et al., 2010). (Aytuğ et al. (1990), (Ferrer et al. 1998), (İmren et al. 1991), Popa E 1998),(Yfruham I et al. 1998), (Mahmoud M et al.2016), Adham EK et al.2009).

The mucous membranes are first hyperaemic, but at the later stages, they become icteric and the colour changes to the pallor of anemia. Primary cause of anemia is due to intravascular haemolysis and rate of destruction of erythrocytes and capacity of erythropoiesis are the main denominators of the occurrence and intensity of the anemia. Feldman B F (1981), Jain J J (1986), (Mosqueda J et al.,2012), (Decaro N et al., 2013).

In Egypt, bovine babesiosis is caused mainly by B. bigemina and B. bovis and consideredas the most important and endemic parasitic disease affecting cattle (Nagati 1947, Adham et al. 2009).

Most often owners are trying to describe the clinical appearance of their animals using less informative symptoms, which often accompanies most diseases. Only few owners are able to describe symptoms, which could be pathognostic initially to babesiosis, and let the veterinarian to apply purposely one or more tests.

Material and Method

Forty (40) Egyptian cattle infected with babesiosis and ten (10 )healthy (as control) were used as animal materials. Blood samples were collected from the jugular vein into EDTA-containing tubes from 50 animals (40 cattle infected and 10 cattle as controls) of both sexes and aged 2–5 years, and were originating from different villages. The animals were examined at the Veterinary unit.

The control group (10 cattle)was carefully examined clinically and parasitologically and found healthy and free from external, internal, and hemoparasites. Approximately 10ml of blood was taken from the jugular vein of all animals with a syringe containing EDTA. The blood samples were subjected to hematological parameters analysis (Schalm et al. 1975, Coles 1986).
Clinical Examination

Animals were subjected to clinical and hematological examinations at Veterinary unit.

The filed-exposed group showed various degrees of bovine babesiosis such as high fever (>40 °C), anorexia, hemoglobinuria (bloody urine), anemia, and jaundice. They were also infested with ticks to various degrees. The control group was examined thoroughly for presence of any abnormal clinical changes and external parasites, and was thoroughly examined by different laboratory techniques such as direct smear, flotation, sedimentation and Barmen's techniques and blood film to confirm the absence of any internal parasites.

Statistical analysis

The obtained data were statistical analyzed by mean of computer statistical program, SPSS (Borenstein et al. 1997). Data were analyzed using Student’s t-test to compare the mean data between groups. The results obtained were expressed as mean ± Differences were considered statistically significant based on P< 0.05.

Results

Clinical Findings

Cattle infected with B. bovis showed typical clinical signs of babesiosis, Table 1.

Briefly, highly rise in body temperature (40–41.5 °C), conjunctival and vaginal mucous membranes were anemic and the clinical severity was ranged from paleness in mild cases to severe yellow discoloration (icterus)in more progressive cases, red to dark red urine (coffee-color) urine, hemoglobinuria was common sign in cattle with severe clinical manifestation and accelerated heart and respiratory rates. Some cases showed nervous manifestations in advanced stages such as incoordination and head pressing. Various degrees of tick infestations were present around groins, horns, Inter-mandibular space, and ears.

Hematological Findings

Giemsa-stained blood smears from B. bovis infected animals showed intra-erythrocytic piroplasms of B. bovis that were in the form of pyriform or pear-shaped.

The mean values of RBCs, hemoglobin amount, PCV %, WBCs, and differential leucocytic count are listed in Table 2. Briefly, the important findings can be summarized as follows; there is a clear significant difference in the haematological parameters between B. bovis-infected buffaloes and B.bovis-infected cattle in comparison to control group at P-value (≤ 0.01) and (≤ 0.001), respectively
Table 1: Clinical findings of *Babaesia bovis* (B. bovis)-infected cattle comparison to control group under natural field conditions

| Parameters       | Infected animals | Control animals |
|------------------|------------------|-----------------|
| Numbers          | 40               | 10              |
| temperature(°C)  | 40-41            | 38.5            |
| Red urine        | present          | yellow          |
| Jaundice         | present          | Not present     |
| Respiration      | accelerated      | normal          |
| Appetite         | decreased        | normal          |
| Recumbency       | 3                | no              |
| Death            | 4                | no              |

Table 2: Hematological findings of *B. bovis*-infected cattle in comparison to control group under natural field conditions (mean ±S.E).

| parameters          | Infected animals | Control animals |
|---------------------|------------------|-----------------|
| RBCs (106 /ml)      | 3.2±1.8***       | 5.2±1.3         |
| Hb (g/dl)           | 5.1±1.4***       | 10.5±2.1        |
| PCV (%)             | 16.8±1.1***      | 33.5±1.1        |
| WBCs (103)          | 11.6±2.1***      | 5.5±1.1         |
| Lymphocytes/ cmm    | 3.5±1.3*         | 2.6±1.1         |
| Monocytes / cmm     | 0.53±2.1**       | 2.3±13          |
| Neutrophils / cmm   | 3.5±1.5*         | 2.9±1.4         |
| Basophils / cmm     | 1.1±1.0          | 1.5±0.1         |

*significantly at P≤ 0.05, **P≤ 0.01 ***highly significant at P≤ 0.001).
Table 3  Biochemical findings of B. bovis-infected cattle in comparison to control group under natural field conditions (mean ±S.E).

| parameters      | Infected animals | Control animals |
|-----------------|------------------|-----------------|
| Ca mg/dl        | 6.2±1.8***       | 10.2±1.3        |
| Ph mg/dl        | 5.8±1.4***       | 3.5±2.1         |
| Copper (µg/dl)  | 153.5±1.5**      | 98.34±2.15      |
| Iron (µg/dl)    | 168.2±1.5**      | 188.25±15.49    |
| ALT(U/l)        | 26.08±1.14***    | 13.78±0.70      |
| AST(U/l)        | 130.26±10.62***  | 28.34±1.6       |
| Total proteins (gm/dl) | 5.82±0.28** | 6.92±0.15 |

*significantly at P≤ 0.05, **P≤ 0.01 ***highly significant at P≤ 0.001

Discussion

Tick-borne diseases have a negative effect on livestock health (Omar AOJ et al.2013). In this study, Babesia infection was confirmed via light microscopy examination. Presence of pear shape piroplasms inside RBCs is confirmative of diagnosis especially in acute stages of the disease (Singh AP et al.2009).

A–Clinical findings

The observed clinical findings in cattle with babesiosis such as fever, dark brown to coffee urine, pale mucous membranes with empty episcleral blood vessels with reduced appetite could be attributed to severe haemolytic process associated the presence of Babesia sp. inside the red blood cells. (Fujinaga 1981) and (Georgi et al. 1990) supported this view.

B–Haematological findings

Leucogram showed significant decrease (P<0.001) in total leucocytic count and neutrophil. Normocytic normochromic anemia observed in cattle with babesiosis which could be attributed to intravascular haemolysis of red blood cells. (Pandy and Misra 1987) supported this view. Insignificant changes in total leucocytic count in total leucocytic count in cattle with babesiosis, while there was significant increase in lymphocytes and monocytes associated with significant decrease (P<0.001) in neutrophils. This could be explained as the breakdown of redblood cells by Babesia sp (Hussein, A.H., et al.2007) (Riond BMM et al. 2008), (Salem NY et al. 014), (Salem NY et al. 2015). Even in animals which
recover spontaneously, erythrocyte count, packed cell volume, and hemoglobin level continue to decline steadily after patency. Once the parasites have been eliminated, increased hematopoiesis occurs, evidenced by the presence of nucleated erythrocytes, polychromasia, and anisocytosis (Purnell et al. 1977).

C–Biochemical findings

Babesiosis infected cattle showed significant decrease in calcium and increase in phosphorus levels, this agree with (O’Neill, A. R. 1983), (Annetta Zintl et al. 2003) who noticed the serum changes may include increased potassium and reduced calcium and sodium levels.

Babesiosis infected cattle showed significant increase in AST, hypoproteinemia. This may indicate the harmful effect of toxic metabolites of Babesia sp. on liver cells. These results were supported by (Yeruham et al. 2003). Serum level of iron was significantly decreased (P<0.001), while copper showed insignificant change. The drop in serum level of iron may be due to anaemia which leads to excessive withdrawal of serum iron to be utilized for erythropoiesis. While others have extremely high concentrations of serum iron (Jerichow, H., and R. Jungmann. 1969).

Babesiosis infected cattle showed significant decrease in protein. Our present study indicate that the serum protein and globulin pattern was significantly altered by babesia bigemina infection. There was a significant decrease in total protein in serum of infected clinical cases and these in accordance with data recorded in cattle (Ashmawy, et al. 1994) (Amrita Sharma et al. 2016), in calves by (Venu. R. et al. 2015) and In buffaloes (Abd El-maksoud, et al. 2005), (Werner LL et al. 2004) (Kerr MG 2002)

Concerning the effect of babesia Bigemina infection on activity of liver enzymes, the obtained results revealed a highly significant increase in serum AST and ALT. These results were in agreement with other previous studies reported by Allen and Kuttler, (1981) Camacho, et al (2005) and Barbara, et al (2008). The increase in enzymes activity may attributed to sever anemia that lead to hypoxic and toxic liver damages. Also massive hemolysis may occur which in conjunction with hypoxia may lead to hepatic cell degeneration and glomerular dysfunction leading to increase in AST, ALT and Bun, Allen and Kuttler, (1981).

Control

Babesiosis infected cattle is often only noticed at the onset of hemoglobinuria, when the disease is far advanced. Although therapy and transfusion will generally save an infected animal even at an advanced stage of the disease, it may continue to be severely debilitated for several months after recovery (Lewis et al.1981). Thus, for economic and animal welfare reasons, the best option is to prevent rather than treat infections.
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