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Original research

Clinicopathological investigations on babesiosis among camels (Camels dromedaries) in Aswan Province, Egypt

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Abstract:

Camel is occupied barren and semi- barren areas. It is to be among important species due to employed for multifunction and different purposes. It has the possibility to face unpredictable environmental conditions. However, hemoparasitic diseases are distinctly disturbing camels in the tropical countries lead to economic loss. Babesiosis is hemoprotozoal disease achieved economic importance resulted from high mortality. So that, our study was conducted to demonstrate an extent of babesia species to induce health risks in camel. One hundred (100) camels obtained from Daraw and Aswan slaughter houses belonging to Aswan Province from period October 2019 to September 2020. The survey camels were apparent healthy. Blood samples were withdrawn from jugular veins for parasitological examination, complete blood picture and biochemical assays. Tissues specimens from lymph nodes and liver of the infected camels exposed histological examinations. Based on the results obtained from this survey; the percentage of babesia infection between slaughtered camels was 5 % during this period. Hematologically, babesia induced a significant reduction in some hematological parameters involving Red blood cells (RBCs), hemoglobin (Hb.) concentration and packed cell volume (PCV) when compared with non-infected camels. Biochemically, aspartate aminotransferase (AST) and urea levels were significantly increased in the babesia infected camels in comparison with non-infected camels. From the histoppathological point of view, babesia infected camels exhibited lymphoid depletion, edema and necrosis in lymph nodes. The liver showed hepatocellular degeneration and portal cirrhosis. It could be concluded that babesiosis was evidently associated with some clinicopathological manifestations among camel species.

Keyword: Camel, Blood parasites, Babesia, Clinicopathological manifestations.

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1- Introduction

Camel is one of animal species has been targeted for multipurpose including transportation and production among community world (Kamani et al., 2008). Whilst camels can tolerate the unpredictable conditions of environment because of their unique adaptive physiological distinguishing, these species confront variable diseases (Swelum et al., 2014).

Till now, blood parasites represnt a public health risk threaten the veterinary and socio-economics in Africa (Mohammed and Elshahawy, 2018). Minimal investigations have inferred the economic importance of haemoparasitic diseases on camels in comparison with other ruminants.

Amongst tick-borne hemoprotozoan parasites, babesiosis is principally considered an important one. The species Babesia genus is apicomplexan-haemoparasites (Schnittger et al., 2012). Babesia arranged in pairs in pear shape with variable angles close to the margin of the infected RBCs. Babesiosis is prevalent included among devastating parasites seriously impacted the production of livestock (Wagner et al., 2002). Camels might infect with Babesia alone or other pathogens as Theileria (Ismael et al., 2014). Worldwide, babesia created major financial losses. Babesia affects the blood constituents resulted in prominent hematological deteriorations including haemolytic anaemia and haemoglobinuria (Wernery and Kaaden, 2002).

By study of the blood components of the hemoparastism camels, it elucidated a reduction in PCV, Hb. concentration, RBC and platelets (PLT) values with an increment in total leucocytic count (TLC). Furthermore, increase in (alanine aminotransferase (ALT), AST, besides decrease in total protein and albumin was also detected (Azeem et al., 2019). Histopathology, tissues damage and destruction observed in many target organs (Coskun et al., 2012; Lima et al., 2019). Therefore, the objective of this study is to demonstrate the clinicopathological investiagtion of babesiosis among camels in Aswan.

2- Materials and Methods

A- Materials:

- **Survey camel:**

The present study was carried out on a total number one hundred (100) of camels in Daraw and Aswan slaughter houses, belonging to Aswan Governorate during period from October 2019 to September 2020. The survey camels were subclinical fit.

B- Methods:

1- Blood sampling:

- **Hematology:**

Two separate blood samples withdrawn from jugular vein of camels for hemato-biochemical investigations. One sample dragged in vacuum tube anticoagulated for complete blood count (Animal Health Research Institute, Dokki, Egypt) and blood smears. While, the other taken in plain tubes; centrifuged at 3000 rpm for 10 minutes. The serum was collected in clean epindorff's tubes and stored at -20° C until biochemical analysis.

- **Biochemical analysis:**
- **Assessment of liver tests:**

Biodiagnostic kits (Biodiagnostic Company, Giza, Egypt) were utilized for enzymatic evaluation of AST and ALT in serum as described by Reitman and Frankel (1957).

Determination of total protein was done using colorimetric method the according to Gornal et al. (1949). Moreover, albumin was assessed by the colorimetric method which described by Doumas et al. (1971). Globulin values were determined by subtraction the value of the albumin from the value of the total protein.

- **Assessment of kidney tests:**

Urea level was determined through colorimetric method mentioned by Fawcett and Scott (1960). Level of creatinine was evaluated by colorimetric method described by Bartles et al. (1972).

2- Histopathological examinations:

Representative samples from lymph node and liver from the Babesia infected camels were taken and fixed in 10 % neutral-buffered formalin. The specimens were subjected thorough tissues processing technique. Fifth µm sections prepared for stain with the Harris haematoxylin and eosin stain (HE.) (Bacha and Bacha, 2000).

3 - Statistical analysis:

The raw data were analyzed in triplicate values through one-way analysis of variance (ANOVA) using SPSS (Statistical Package for Social Sciences) according to Borenstein et al. (1997). The results were expressed as Mean ± Standard Deviation. The significant difference was set at $P< (0.05)$.

3- Results and discussion:

Infectious diseases in particular tick-borne hemoprotozoan are seriously threat animal health and production especially in the developing countries. Haemoparasites are considered major public health associated with socio-economic problems mainly in Africa (Mohammed and Elshahawy, 2018). It is correlated with intensive clinical alterations as anemia, wasting and death in heavy infection (Mahran, 2004).

Our results illustrated the pear forms of Babesia within the erythrocytes among 5 % the examined camels in blood film **(Fig. 1)**.

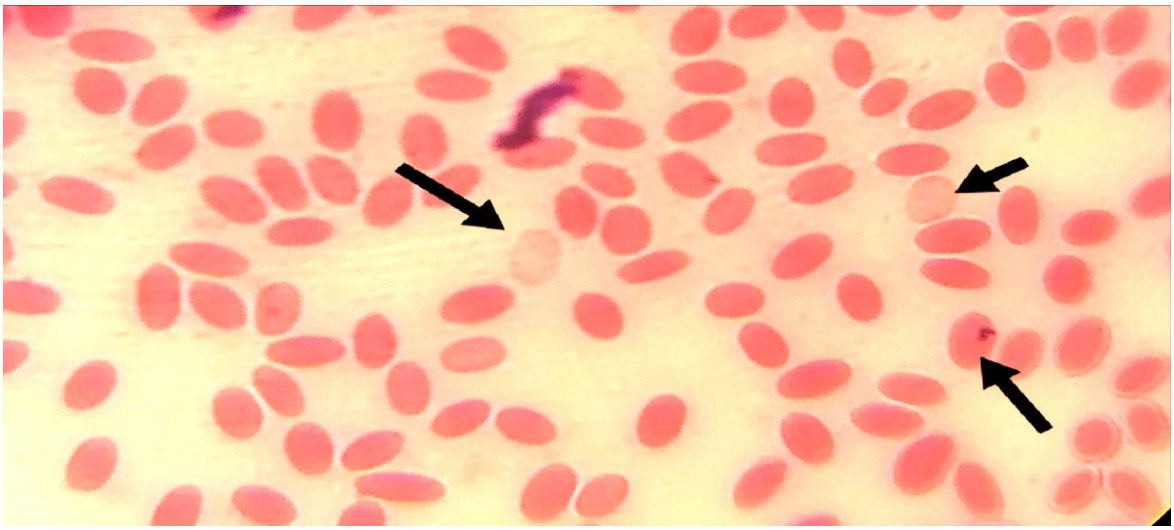

Fig. (1): Giemsa-stained blood film from examined camel showing Babesia merozoite located in the erythrocyte (black arrow), found as pairs that are at an obtuse angle to each other. Note also hypochromic erythrocytes. (Giemsa stain, X 1000)

There was significant decrease (P<0.05) in RBCs count, Hb. Concentration, and PCV % in Babesia infected camels when compared with non-infected camels **(Table, 1)**. While other parameters including white blood cell (WBC) count, mean cell hemoglobin (MCH), and mean cell hemoglobin concentration (MCHC) values showed non-significant changes in Babesia infected camels when compared with non-infected camels **(Table, 1)**. Existing of haemoparasites in camels induced a reduction in growth rate with deficiency in milk production. Moreover, it deviates blood components leading to haematological alterations (Rabana et al., 2011). The overall prevalence of babesia in our study was 5 % among the infected camels. The results of haematological examination showed relatively significant decrease in values RBCs count, Hb. concentration, PCV in Babesia infected camels compared to non-infected camels. Blood parasites like Babesia are invading erythrocytes of infected animals initiating parasitemia leading to destruction of parasitized erythrocytes (Otsuka et al., 2002), intravascular hemolysis of erythrocytes, and stimulate erythrocytic phagocytosis by the reticuloendothelial system, with restriction in erythropoiesis in the bone marrow (Nasreen et al., 2016).

Table (1): Hematological parameters including RBCs, WBCs, hemoglobin, PCV, MCH, and MCHC of non-infected camels and Babesia infected camels.

Parameters / Groups	Blood parameters					
	RBC's ($x10^3$)	**WBCs ($x10^6$)**	**Hb. (gm/dl)**	**PCV (%)**	**MCH (Pg)**	**MCHC (%)**
Non infected camels	**11.0±0.8**	**11.2±0.5**	**14.3 ±1.1**	**32 ±0.9**	**13.0±1.1**	**44.6±0.4**
Babesia infected camels	**8.5±0.7***	**9.9±0.87**	**13.9±0.5***	**28.4±0.8***	**15.5±0.5**	**47.8±0.3**

*→ is referring to significant changes in comparison with non- infected camels when P<0.05 %.

Biochemically, AST level revealed significant increases (P<0.05) in Babesia infected camels in comparison with non-infected camels **(Table, 2)**. While, ALT activity non-significantly changed in comparison with non-infected camels **(Table, 2)**

Table (2): Liver function tests of non-infected camels and Babesia infected camels.

Parameters / Groups	Liver Function Tests	
	AST (IU/l)	**ALT (IU/l)**
Non infected camels	**69.6±2.5**	**11.0±1.0**
Babesia infected camels	**114.6±2.0***	**13.5±1.0**

*→ is referring to significant changes in comparison with non-infected camels when P<0.05 %.

The mean levels of the total protein, albumin and globulin exhibited non-significant decrease in Babesia infected camels in comparison with non-infected camels **(Table, 3**).

Table (3): Level of total protein, albumin, and globulin (gm/l) of non-infected camels and Babesia infected camels.

Parameters / Groups	Protein profile		
	Total Protein (g/dl)	Albumin (g/dl)	Globulin (g/dl)
Non infected camels	**9.53±2.1**	**3.14±0.5**	**6.4±1.7**
Babesia infected camels	**7.3±1.2**	**2.4±1.1**	**4.9±0.7**

The mean levels of the urea was significantly increased (P<0.05) in Babesia infected camels when compared to non-infected camels **(Table, 4)**. However, levels of the creatinine exhibited non-significant changes when compared to non-infected camels **(Table, 4)**.

Table (4): Kidney function tests of non-infected camels and Babesia infected camels.

Parameters / Groups	Kidney function test	
	Urea (mg/dl)	Creatinine (mg/dl)
Non infected camels	**25.0±1.5**	**1.1±0.0**
Babesia infected camels	**49.3±2.0***	**1.3±0.2**

*→ is referring to significant changes in comparison with non-infected camels when P<0.05 %.

It showed relatively significant increase in the AST may be due to indirect damage of liver and myocardium; changes are associated with possible alterations to liver enzymes (Yfruham, et al., 1998), additionally increase in the AST due to distraction of RBCs.

Significant elevation in level of urea was attributed to colonization of Babesia like *B. ovis* in the renal blood circulation leading to kidney dysfunction (Uilenberg, 2006). Ovine babesiosis could induce impairment of the renal function and some histological disturbs such as acute proliferative glomerulitis and tubular necrosis with thrombosis and congestion of the renal blood vessels (Habella et al., 1991).

Histopathology, Babesia infected camels showed hyperplasia in lymphoid follicle of the lymph nodes. The lymph nodes in some cases suffered from lymph adenitis, neutrophilic cellular infiltration and necrosis in lymphocytes as well as hemorrhage **(Fig. 2 a-b-c)**. Hepatocellular degeneration and portal cirrhosis were seen in the liver **(Fig. 2 d).**

Babesia showed marked histological alterations at this result agrees with Mohammed and Elshahawy (2018) reported that Babesia bovis, induced renal infarction, hepatic degeneration. Our pathological results in the examined lymph node from infected camels are agree with Levine (1961) who recorded that, blood Babesiosis induced hyperplasia of the reticuloendothelial system mainly in lymph nodes with lymphadenopathy, swelling, mass or enlarged lymph nodes. Also, Wozniak et al. (1997) mentioned that babesia gibsoni infection was manifested by reactive lymphadenopathy resulting in activation and expansion of T and B lymphocyte populations, macrophage recruitment and activation. Similarly, SudhakaraReddy et al. (2016) noted that clinical examination of Babesia infection in dogs reveals lymphadenopathy characterized by swollen lymph nodes and icterus. The main reason for pathological change resulted from progressive hypoxia and related anemia (Shiono et al., 2001).

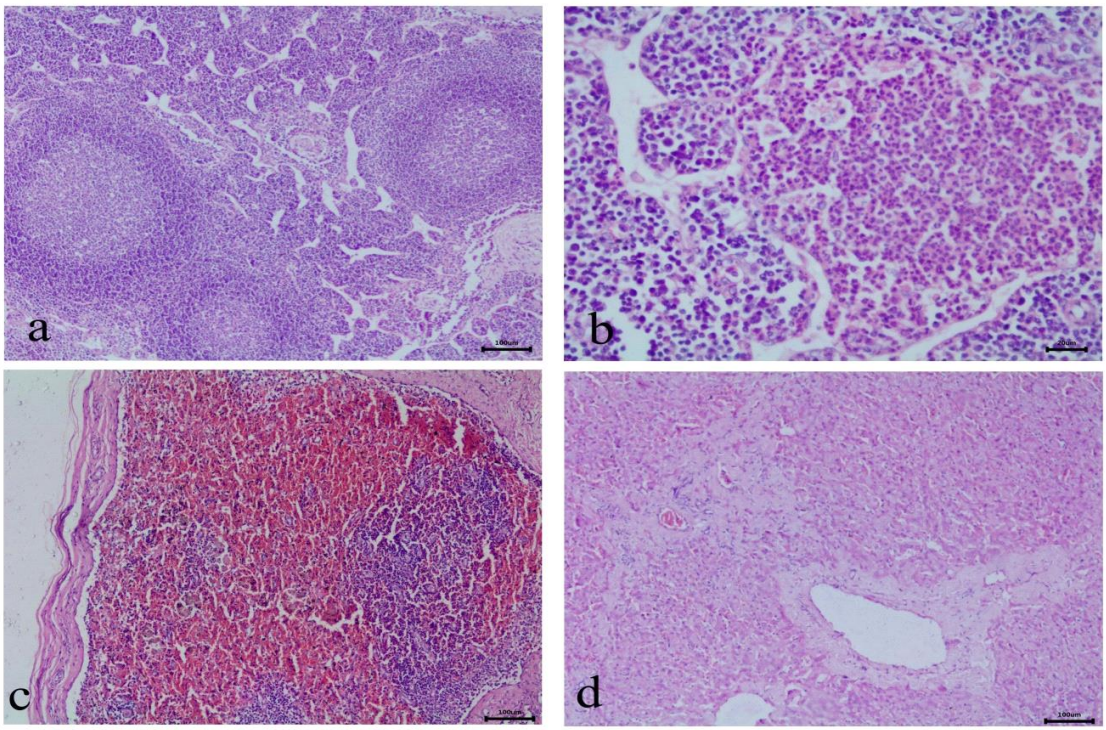

Fig. 2 (a-d): (a) Photomicrograph from lymph node of Babesia infected camel showing hyperplasia in lymphoid follicle. **(b)** Photomicrograph from lymph node of Babesia infected camel showing lymphadenitis with neutrophilic cellular infiltration. **(c)** Photomicrograph from lymph node of babesia infected camel showing severe hemorrhage in lymph node. **(d)** Photomicrograph from liver of Babesia infected camel showing portal cirrhosis in liver. H&E stain. (H&E stain, bar=20 &100 µm).

4- Conclusion:

From the obtained results, it could be concluded that most of positive cases with Babesiosis are clinically health, this means that we face problematic to cure these infected animals as they become carriers of parasite and serve as reservoirs for transmission of infection to other animals. Even in these carrier animals, there were clinicopathological deteriorations involving hematological and biochemical alterations as well as histolopathogical changes on the target organs of the examined camels.

5- Recommendation:

Screening and treatment of infected and carrier animals as well as control program of the vectors must be done.

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