Sudan Journal of Science and Technology
Journal homepage:
http://jst.sustech.edu/

Bovine Babesiosis in Elfasher Locality – North Darfur State

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ARTICLE INFO

ARTICLE HISTORY
Received: 9/2/2020
Accepted: 11/3/2020
Available online:June2020

KEYWORDS:
Babasiosis, Cattle, Ticks, Elfasher locality

ABSTRACT

This study was conducted in September 2017 to March 2018 in Elfasher Locality – North Darfur State to identify *Babesia* species and ticks infected cattle and to determine some hematological and biochemical parameters associated with these species. A total of 227 whole blood samples were collected from cattle randomly in Elfasher Locality for identification of *Babesia* parasites using Gemisa stain. Packed cell volume was determined in 100 samples by using microhematocrit technique. Biochemical parameters [Total protein, albumin, bilirubin, calcium, sodium and potassium] were determined in 100 serum samples. One hundred and fifty five tick samples were collected from 23 cattle for identification. The result revealed that 133 smear samples were positive to *Babesia* species with overall prevalence rate 58.5%. A significant decrease of packed all volume [$p<0.01$]. All biochemical parameters showed no statistical significant difference, but serum calcium showed significant difference [$p<0.01$]. There were 2 genera of ticks were identified and these were *Ripicephalus* and *Hyalomma,* included 7 species and these were *Ripicephalus evensi eversi* [37.5%], *Hyalomma anatolicum* [21.9%], *H.impletatum* [16.2%], *H.dromedarii* [12.9%], *H. rufipes* [1.2%], *H. truncatumim* [9.0%] and *H.predixtatus* [1.2%]. In conclusion, bovine babesiosis is the most important tick – borne disease of cattle in Elfasher locality leading to death of the animals due to anemia.

Introduction:

Bovine babesiosis considered as important arthropod-borne disease of cattle in wide regions in the world causing a significant morbidity and mortality rates. The major economic impact of the disease in cattle is cattle industry (Bock *et al.*, 2004; Enbiyale *et al.,* 2018). Also costs resulting from babesiosis are not only from morability, ill-thirft, abortions, loss of milk and meat production, draft power, and control measures such as acricide treatment, purchase vaccines and therapeutics, but also through its impact in international cattle trade (Bock *et al,.*2004). Now a day babesiosis affecting many species of mammals with a major on cattle and man [Schorn *et al.,*

2011; Hamsho *et al.*, 2015]. This disease is tick intra-erythrocytic apicomplexan parasites distributed in cattle in tropical and subtropical regions and the major species are *Babesia bovis*, *B. bigemina, B. divergens, B. major, B. ovate, B. occultans and B. Jakiovi* [Sharma *et al.*, 2000; Criado Fornelio *et al.*, 2003; Bock *et al.*, 2004; Spickler *et al.*, 2013]. Implications of babesiosis as zoonotic disease is reported and *B. divergens* infected cattle population and *Ioxides ricinus* infested areas. This species causing human babesiosis in Europe and North America resulting in fatality. In United States human babesiosis caused by *Babesia microti* and this parasite transmitted to the human by contact deer ticks (Radostits *et al.,* 2007). During penetration and development of *Babesia* spp. pharmacological role that resembles a hemolytic anemia [*B. bigemina*] and kallikren [Kinin] produces in the plasma which increase vascular permability and vasodilation occurs leading to circulatory stasis and shock. Also due to destruction of erythrocytes packed cell volume is decreased. This substance causing changes of coagulation parameters and excessive loss red blood cells by absorption of circulating antigen-antibody complexes to the surface of red blood cells and removed by phagositosis. Severe anemia can be developed due to hypocomplementemia and gromular deposits [gromulonephritis] of 1g and C3 [Soulsby, 1982].

The main vectors of *Babesia* species in cattle are *Boophilus microphus*, *B. decoloratus, B. annulatus, B. geigyi, Rhipicephalus evertsi, Ixodes ricinus; I. persulcatus, Haemaphysalis punctuate* and *H. longicoronis* [Bock *et al.*, 2004]. The infection of this hemotropic disease is diagnosed by high fever [40-41^{o}c], weight loss, ruminal atony, dyspnea, hymoglobin urea (red water urine), lethargy, diarrhea, hemolytic anemia [The mucous membranes are first hypremic but later they become ictric and pallor], and tachycardia. In chronic infection there is no hemoglobinuria. Acute *B. bovis* develops fatal cerebral babesiosis with hyperaesthesia, convulsion and paralysis due to aggregation of red blood cells in the cerebral capillaries and extravascular following endothelial damage [Figueroa *et al.*, 2010; Moghyazy *et al.*, 2014; Mohamed Saied 2017]. For laboratory examination hematological methods are used [RBC, PVC, Hb, Smears] to showed alteration of blood [Callow *et al.*, 1993; Brose *et al.*, 1995]. Serological tests are used for diagnosis of the disease [Jonston *et al.*, 1977; Brose *e. al.*, 1995; DeVos *et al.*, 2000]. PCR assays also used to detect the relative sensitivity DNA probes. For detection of *Babesia* in both tick vector and vertebrate host simple or multiplex PCR-amplification of 18S rRNA gene fragment can be applied [Brose *et al.*, 1995; Alhassan *et al.*, 2005]. The alteration of enzyme activity in babesiosis in cattle resulting from liver damage. Also the changes in bilirubin due to congestion of hepatic vessels and liver destruction [Akinboade *et al.*, 1984; Mohamed Saied, 2017]. At necropsy there is hypotensive shock syndrome with intravascular stasis and sequestration of parasitized red boold cells in the peripheral circulation. The characteristic lesion that cherry pink discoloration of cerebral cotex due to acute *B.bovis* infection. Also the spleen is enlarged soft and pulpy, sowollen liver, congested dark-colored kidneys. Other organs are congested or there are petechial hemorrahages and pulmonary edema [Bock *et al.*, 2004; Sharma *et al.*, 2013].

Successful treatment after early diagnosis of the parasites. Antiprotozoal agents diminazene acceturate and imidocarb dipropionate have a high affectivityagainst *Babesia* parasites [DeWaal and Combrink, 2006; Mosqueda *et al.*, 2012]. For prevention and control of this disease there are immunization, chemoprophlaxis and vector control. Vaccination can be used with caution in adult animals due to virulent of contamination with other disease agents and leading to hypersensitivity reactions in young animals [Demessia and Derso, 2015].

The Sudan has a huge size of cattle and the population are estimated of about 41.43 million head [Anon, 2008] and is ranking as the second biggest country in Africa and sixth in the world. The types of breeds found indigenous ecotype of zebu cattle, and this included Foga, Baggara, Kenana, Gaash and Butana or cross-breed of this ecotype with exogenous breed and these Frisian, Ayrshire and Holstein [Fadlelmoula *et al.*, 2007]. Boshara (2013) stated the prevalence rate of *Babesia* species in 300 cattle in East Darfur State and the overall prevalence rate reached 18%. While Awad *et al.* (2011) recorded the overall prevalence rate in 692 healthy cattle by using polymerase chain reaction to *Babesia bigemina, Babesia bovis* and *Anaplasma marginal* 4.0%, 1.9% and 6.1% respectively in northern region of Sudan. The aim of this paper was to identify *Babesia* spp. and tick vectors in cattle and to determine some hematological and biochemical parameters associated with the parasites in Elfasher locality.

Materials and Methods:

Study area:

This study was carried out from September, 2017 to March 2018 in Elfasher Locality – North Darfur State.

Collection of samples:

Atotal of 227 whole blood samples were taken from 2-4 years old cattle [5ml] by jugular vainpuncture randomly for smearing by using Giemsa staining method [McCosker, 1975[and estimation of packed cells volume [100 samples] by using microhemtocit method [Coles, 1986]. Also 100 blood samples were collected simultaneously for serum speparation for determination some biochemical parameters [Total proten, albumin, bilirubin, calcium, sodium and potassium] using test kits [Bio-system, S.A. Spain]. One hundred and fifty five ticks samples were collected from 23 animals in 70% ethanol for identification using Estrada standard [Estrada -Pena *et al.*, 2004].

Statistical Analysis:

The data statistically analyzed by SPSS version 13. Descriptive statistical and T-test were used for analysis.

Results:

The overall prevalence of bovine babesiosis

Examination of 227 smear samples and there were 133 samples positive to *Babesia* spp and 94 were negative. The overall prevalence of the disease was 58.5% [Table 1]

Table (1)The Overall prevalence of babesiosis in cattle [n=227] in Elfasher Locality – North Darfur

	Number of animals	Frequency %
Positive	133	58.50
Negative	94	41.50
Total	227	100.00

Biochemical analysis:

As shown in table 2, there was significant decreased in packed cell volume in the infected animals, compared with non-infected animals. While all biochemical parameters showed no statistical significant difference to disease. But serum calcium levels showed significant difference [$p<0.01$].

There were 2 genera of ticks were identified and these were *Ripicephalus* and *Hyalomma,* included 7 species and these were *Ripicephalus evensi eversi* [37.5%], *Hyalomma anatolicum* [21.9%], *H.impletatum* [16.2%], *H.dromedarii* [12.9%], *H. rufipes* [1.2%], *H. truncatumim* [9.0%] and *H.predixtatus* [1.2%].

Table (2) The mean ± Standard error for some biochemical parameters associated with babesiosis in cattle [n=227] in Elfasher Locality – North Darfur State.

Parameters	Infected	Non-infected	Significant
PCV	24.02±10.26	34.08±10.57	**
Total protein	6.02±071	6.10±1.28	NS
Albumin	2.55±2.36	3.06±1.52	NS
Bilirubin	1.42±0.51	1.60±0.98	NS
Calcium	11.10±5.78	14.52±5.93	**
Sodium	134.82±5.60	136.66±14.17	NS
Potassium	3.80±4.41	3.97±0.85	NS

** = Significant at $p<0.01$, NS= No significant differences

Discussion:

Tick-borne diseases have affected the health of livestock leading to economical loss of productivity [ElAshker *et al.*, 2015; Omar *et al.*, 2015]. In th present study, the overall prevalence rate was 58.5% by microscopic examination of *Babesia* species [Table 1]. This prevalence is highest than prevalence in Danapur [35.5%] and Fatuna [26.21%] after retrospective data collected from Pantna using Giemsa stained thin blood smear method [Kumari and Kithin, 2018]. The result of Matovu *et al.* [2014] using microsopical prevalence for identification of *Babesia* species is lower. Also Shuaib *et al.* [2015] found that after examination of 803 thin blood smears the prevalence rate is 5.20% and this is lower than this result. This results are higher than that reported by Salih *et al.* (2008), in equatorial region (51.50%). Also Kivzari et al. (2012) recorded the prevalence rate 52.80% in South region. But the overall prevalence in this study is lower [Table 1] than recorded by Radostits *et al.* [1994] and Kumari and Jithin (2018) during rainy season [58.55%) with increase humidity which favor the development of ticks as vector of the disease. Immunofluorescent antibody test is more sensitive test and giving of high prevalence rate [68.7%] of bovine babesiosis [Shuaib *et al.*, 2015].

Packed cell volume was significantly decreased [Table 2]. This finding in agreement with findings of Pandy and Misra [1987] and Mohamed Said [2017] who recorded that when the parasites are entered the blood circulation and invaded red blood cell membrane leading to intravascular hemolysis. Erythrocyte count, packed cell volume and hemoglobin level can be continued to decline steady after patency even the animals are recovered, but after the hematopoiesis is increased [Lewis *et al.*, 1981; Soulsby, 1982].

The study showed there was decreased in serum calcium level, this result in accordance with data recorded in cattle babesiosis [O'Neill, 1983; Zintl *et al.*, 2003; Mohamed Saied, 2017]. Generally, changes of calcium level due to mineral metabolism disturbances resulting from clinical or bone disease [Coles, 1986].

In these results, there were no changes in serum level of sodium, potassium, total protein and albumin. These results in contrast with Mohamed Saied (2017) who found that the increase in potassium level can be decreased, calcium, sodium and protein due to the harmful effect of toxic metabolites of *Babesia* spp. Also in these results serum bilirubin level was not altered, because no congestion of hepatic vessels due to the action of the parasites [Allen and Frerichs, 1975. Akinboade *et al.*, 1984]. From this study there were 2 genera of ticks were identified and these were *Ripicephalus* and *Hyalomma,* for transmission of bovine babesiosis. Friedcoff (1988) and Uilenberg (2016) found that *Ripicephalus* species have been implicated in the transmission of *Babesia* species to cattle and human. Also Altay *et al*. (2008) recorded that *R. bursi* was the main vector of cattle babesiosis in eastern Turkey. There are several studies carried out in Mediterranean region confirming that *R. bursi* transmitted *Babesia bovis and B. bigemena* (Bouattour and Darghough, 1996; Ravindran *et al*., 2006; Ghirbi *et al*., 2010).

In conclusion, bovine babesiosis is the most important tick-bone disease of cattle in Elfasher locality leading to death of the animals from anemia when the disease occurred in acute stage and may lowering the productive performance, specially the breed exports for improving the productivity of local cattle.

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