



## Prevalence of Bovine Ileriosis and Ticks Infestation in Northern State-Sudan

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### Abstract

This study was conducted for determination of bovine theileriosis and investigation of associated potential Risk Factors and cattle tick infestation in Northern State, Sudan. A total of 329 blood samples from cattle were collected randomly from January 2018 to January 2019 and examined for parasite using direct smear Geimsa stain method. Questionnaire was included; locality, breed, sex, age and season. Also 1252 tick samples were collected from 313 cattle in 70% ethanol for identification. Blood smears were revealed 11.6% prevalence rate of the disease. The following risk factors showed association with cattle theileriosis in the univariate analysis under significant level of P-value  $\leq 0.25$ : sex (P-value= 0.432), age (P-value =0.001), breed (P-value= 0.000). there was two genera of ticks were identified which were *Hyaloma* and *Rhizocephalus*. Sex species of these two genera were *H.rufipus*, *H.dromadarii*, *H.impltatum*, *H.anatolicum* and *R.evansi*. In conclusion, the disease is prevalent in Northern state.

**Keywords:** Prevalence, Bovine, Ileriosis, Ticks.

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### Introduction

*Theileria spp* is an intra-erythrocytic protozoan parasite infecting cattle. The parasite forms in the erythrocytes were predominantly rod shaped and no schizonts were detected in the prescapular lymph node impression smears as reported by Nasser (1992).

Theileriosis is group of disease caused by the protozoan parasite of genus *Theileria* and transmitted only after cyclical development in ixodid ticks. The sign of illness in cattle is include enlargement of super facial lymph nodes namely parotid pre scapular

(Rbison, 1982). Rise in body temperature, difficult breathing and frothy exudates from nostrils are reported (Boulter and Hall, 2000). Diarrhea, lacrimation which may lead to corneal opacity or complete blindness and loss appetite are often present (Norval *et al.*, 1992). Then *Theileria annulata* infection cause severe economic losses including losses due to expensive anti-theilerial drugs, cost of prevention and control measurement, losses due mortality and drop of milk productivity of infection animal and pregnant cow may also abort and remain infertile for long time (latif, 1994). The

causative agent of tropical theileriosis is maintained exclusively in cattle occur with rang of distribution of vector *Hyalomma anatolicum* ( FAO,1983) . Theilerial infection wide spreading in Sudanese cattle (Shommein, 1976; Morzaria *et al.*,1981; FAO, (1983). *Theileria annulata* infection in cattle it is most important TBD in northern Sudan -River Nile (Elhussein *et al.*, 2004). The picture of tick infestation and theileriosis in cattle in Northern State is not yet clear.The objective of the study to determine the prevalence of theileriosis in cattle in Northern state ,and study risk factor associated with the disease , and to identify ticks infestation in cattle in northern state .

## Material and method

### Study area

The study was carried out in Northern State, Sudan, which are located about 310 Km north of Khartoum, 20°32 E longitudes and 16°22 N latitude. The temperature ranges from 5°C at cold season and 49°C at hot season and the humidity less than 20%. The mean annual rainfall of the state is about 250mm/year.

### Study design and sampling:

A cross-sectional study design was conducted in Northern State in different localities which include, Northern area included 6 site from Halfa and Dalgo , Middle area consist of 9 site from Dongla, Alburgag and Alogoled and southern area included 9 site from Merowe and Aldba, for determination of theileriosis in cattle. Information regarding age, sex, origin of the animals was recorded during collection of sample by using questionnaire. The ages of the animals were determined based on owners' information. Sampling technique was applied to select animals at the study area.

Sample size determination: Sample size was calculated according to the formula given

$$N = \frac{4 \times P \times Q}{L^2}$$

N= sample size P=expected prevalence

L=desired absolute precision

Q = (1-P)

The sample size result was 329 head of cattle (Martin and Willeberg, 1987).

Sample collection and transportation:

Blood sampling were done after proper restraining of the animal according to Urquhart *et al.*, (1996). Before blood collection, the area of puncture was cleaned, hair removed and disinfected with 70% alcohol. Thin smears were prepared by applying the slide with blood on to a clean slide at an angle of 45° and then gently moving forward. The slide was air dried and fixed for 2 minutes in methyl alcohol (absolute methanol). Soon after the slides were fixed and air dried it was entered into slide box and transported to Veterinary Parasitology Laboratory for examination of the parasites.

### Examination of cattle

Three hundred and twenty three head cattle were clinically inspected for the presence of ticks according to Köhler-Rollefson *et al.*, (2001), tick were identify under dissecting microscope according to Hoogstraal (1956) in Central Veterinary Laboratory (CVRL-Soba). Blood samples were collected from 329 cattles into clean and dry sterile tubes containing Ethylene Diamine Tetra-acetic Acid (EDTA) as an anticoagulant. These samples were used for preparation of blood films. Thin blood films from each camel were prepared, fixed by methanol stained with Giemsa stains (1:10), by tap water and upright air dried and then examined microscopically (Burgdorfer, 1970). The erythrocytic form of *Theileria* was rod, rounded and ring shaped.

### Laboratory investigation procedures

Giemsa staining procedures and microscopic examination of slides was conducted according to OIE (2012) and Burgdorfer (1970). The slides was immersed in Giemsa stain (1:10 solution) in staining rack for 30 minutes. Then the slides was washed with distilled water to remove excess stain and made air dry. The stained blood smears was examined under oil immersion lens of microscope (100X) for appreciation and identification of different *Theileria* species according to their morphological characteristics.

### Data analysis

The data collected and was analyzed by the statistical software called SPSS for Windows

(Stata Corp. College Station, USA). The prevalence was calculated by dividing the number of camel found to be positive for *Theileria* by the total number of cattle examined for *Theileria* spp. The association of risk factors for theileriosis was assessed using Chi-square test.

### Results

Thin blood smears and Geimsa stain method were used in 329 bloods of cattle for examination of theileriosis. Thirty eight animals were found positive (11.6%) and 291 animals were negative (88.4%) to cattle theileriosis (Table 1). Therefore the overall prevalence of cattle theileriosis in Northern state was 11.6%.

**Table 1: The Prevalence of cattle theileriosis in 329 cattle inNorthern State-Sudan.**

	Frequency	Percent
Positive	38	11.6
Negative	291	88.4
Total	329	100.0

### Sex of animal

Total number of female examined was 225 animals. Among these, 27 animals were found infected. The rate of infection was 12%. Total number of males examined was 104. among these, 11 animals were found infected. The rate of infection was 10.6% (Table 2).

The Chi-square test, showed that there was no significant association between theileriosis and sex of animals (p-value >0.05).

### Age of animal

The number of less than or equal 1 year of age was 187 animals. Among these, 30 animals were found infected. The rate of infection was 16.8 %. While the number of animals more than 2 years was 153 animals. Among these, 8 animals were found infected. The rate of infection was 5.2% (Table 2).

In the Chi-square test, the result showed that there was significant association between theileriosis and age of animals (p-value <0.001).

### Previous history of disease of animal

About 92 animals were found had previous history of disease among these 35 animals were found infected. The rate of infection was 39% and 237 animals were found without previous history of disease among these 3 animals was found infected and the rate of infection was 1.2% (Table 2) .The Chi square test showed that there was highly significant association between theileriosis infection and previous history of disease (p-value <0.005 ) .

### Present of ticks in the animals

As shown in table 2, 313 animals were found infested by ticks and among these 38 animals were infected by theileriosis. The

rate of infection was 12.1% and 16 animals were found free from ticks (0.0%).The Chi square test showed that there was highly significant association between theileriosis infection and present of ticks in animals (p-value=0.000 ).

Localities relative prevalence of bovine tropical theileriosis:

Total number of examined cattle in Dongla was 167 animals. Among these, 26 animals were found infected. The rate of infection was 15.6% .While the total number of examined was in Merowe 91 animals. Among these, 8 animals were found infected. The rate of infection was 8.9% .Total number

of examined in Aldbh was 42 animals. Among these, 3 animals were found infected. The rate of infection was 7%. Total number of examined in Halfa was 49 animals. Among these, 1 animal were found infected. The rate of infection was 2% (Table 2).

Season relative prevalence of bovine tropical theileriosis

The number of animal examined in summer 189 animals among these no animals were found36 infected and the rate of infection was19.4 % .In winter the animals examined 140 among these found 2 infected and the rate of infection was 1.4% (Table 2,)

**Table 2 : Summary of Risk factors frequency for the distribution of 329 cattle examined for theileriosis in Northern State – Sudan.**

Risk factor	Frequency	Relative frequency (%)	Cumulative frequency (%)	Significant Difference
Sex of animal :				NS
Female	225	31.6	31.6	
Male	104	68.4	100	
Age of animal :				*
≤year	176	53.5	53.5	
>year	153	46.5	100	
Breed of animal:				*
crossbreed	169	51.3	51.3	
local breed	160	48.7	100	
Previous history of disease of animal:				*
Present	137	41.6	41.7	
Not present	192	58.4	100	
Present of ticks in animal :				*
Yes	313	95	95	
No	16	5	100	
Localities				NS
Dongla				
Merwoe				
Aldbh				
Halfa				
Seasons				NS

\*P<0.05 Significant Difference, NS P>0.05 No Significant Difference

**Table(3): 1252Ticks males/females collectionfrom 313cattle from localities of Northern State**

Tick-spp	Dongla	Merwoe	Aldbh	Halfa	Total
<i>H.rufipus</i>	130/82	65/35	35/32	28/21	258/170
<i>H.impletatum</i>	80/52	34/20	10/2	20/6	144/80
<i>H.anatolicum</i>	77/29	40/21	4/36	10/5	131/91
<i>H.droedarii</i>	60/39	20/5	24/22	23/4	127/70
<i>H.trancatum</i>	35/30	13/16	0/4	8/2	56/52
<i>R.evansi</i>	17/29	8/19	0/0	0/0	25/48
<i>Total</i>	399/261	180/116	73/96	89/38	741/511

*H=hyalomma/R=Rhipociphalus*

### Discussion

Pathogenic protozoa belonging to the order Piroplasmida include *Babesias* species and *Theileria* species are common pathogens transmitted by ticks and are of significant importance in many domestic animals, including cattle. The Bovine tropical theileriosis is serious constrain to cattle industry in Africa and Asia (Soulsby,1986). Also, Tropical theileriosis (*Theileria annulata* infection of cattle is the most important tick born disease in northern Sudan (Elhussein *et al.*, 2004). The active cases of the disease were 76 animals in the present study with characteristic enlargement of the lymph nodes in particular, superficial parotid prescapular node ,fever, laceration, diarrhea and difficult breathing (Robison,1982). According to Shommein (1976) the incidence of disease in single farm was 10.46% and sero prevalence 86.5% in Khartoum ,17.9% in western part of Sudan(Elhussein *et al.*,2004) . But Elghali and Elhussein, (1995) reported prevalence rate was 15% and 18% during period 1991/1992/1993 in northern state. In this study the prevalence of disease was 11.6% . The prevalence rate of infection higher in adult cross breed than indigenous cattle (Elhussein,1991). Also Osman (1976), Shommein and Hagir, (1988) reported that exotic cattle are more susceptible to theileria infection than local cattle .Cattle of local breeds are generally more resistant than

exotic one (Gharbi *et al.*, 2014). Whereas the difference between the two breeds are due to the difference in genetic to sensitivity to tropical theileriosis infection (Jenson *et al.*, 2008). Shommein, 1976; Robison,1982; Elhussein *et al* ,2012. Multivariate logistic regression analysis of breed and age of cattle were identified as potential risk factor for the disease in Khartoum. Crossbreed cattle have high infection than indigenous cattle. Also in these study the prevalence of the disease among Northern State localities is 7.9% in Dongla, 1%, in Aldbh, 2.43% in Merowe and 0.7% in Halfa. Experimentally in the Sudan four Friesians calves died in pens after exposure to lethal challenge of *Theileria annulata* while none of the local calves died Elhussein *et al* (1991). Elhussein *et al.* (1991) and Latif *et al* (1994) found the disease higher in younger animals. Prevalence of disease among age group less than one year is 9.2% (calves), but the prevalence among the animals more than two years were 2.4%. Elghali and Elhussein (1995) reported that *Theileria* in cattle is a serious problem in River Nile state- Northern Sudan during summer resulting of heat stress, break down of immunity .Similar result in these study was found prevalence in summer 10.7% and in winter 0.7%. Tick and Tick born disease widely distributed in Sudan constituting serious constrain on production of milk and development of meat industry. More than 70 species of tick had

been identified in Sudan (Hoogstraal,1956). Shommein, (1976) found that Theileriosis in Sudan transmitted by the *Hyalomma anatolicum*, *H. rufipes*, *H. detritum*, *H. marginatum*, *Rhipicephalus evertsi*. In these study there were two genera of ticks, *Hyalomma* and *Rhipicephalus*. Six species *H. rufipes*, *H. anatolicum*, *H. dromedarii*, *H. impletatum*, *H. truncatum*, *R. evansi*. Walker *et al.*, (1983) found tick breeding activities increase in dry hot season (August) could have resulted from stress by sudden change in the macro climate from wet to cool dry. Walker *et al.* (1983) and, they found increase in tick activity during end of rainy season and cool dry period. The results showed increase in tick activities and infestation during summer season, but it is decreased in winter season. Bovine tropical theileriosis infection cause severe economic losses due to expensive anti theilerial drugs, cost prevention and control measurement, losses due to mortality, drop of milk productivity of affected animal, pregnant cow may also abort and remain infertile for long time (latif,1994).The majority of the cattle owners revealed that economic impact of disease by loss of milk, growth, death and cost of tick control and disease treatment. It was concluded that theileriosis is prevalent in Northern state. There is need for further investigation using more advance technique for identification of the carriers' cattle of theileriosis.

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## انتشار داء الثيليري البقري وانتشار القراد في الولاية الشمالية السودان

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1 و 3/ قسم الطب الوقائي و الصحة العامة ، كلية الطب البيطري ، جامعة السودان للعلوم و التكنولوجيا

2/ المعمل البيطري المركزي ، سوبا

### المستخلص

أجريت هذه الدراسة لتحديد داء الثيليريا البقري والتحقيق في عوامل الخطر المحتملة المصاحبة وانتشار الماشية في الولاية الشمالية بالسودان. تم جمع 329 عينة دم من الماشية بشكل عشوائي من يناير 2018 إلى يناير 2019 وتم فحصها بحثاً عن الطفيليات باستخدام طريقة المسحة المباشرة لصبغة Geimsa. تم تضمين الاستبيان المكان، النسل، النوع، الجنس، العمر والموسم. كما تم جمع 1252 عينة من 313 ماشية في 70% الإيثانول لمعرفةها. تم الكشف بواسطة مسحة الدم عن معدل انتشار المرض 11.6%. وأظهرت عوامل الخطر التالية الارتباط مع داء الثيليريا الماشية في التحليل وحيد المتغير تحت مستوى كبير من قيمة  $P \leq 0.25$ : الجنس (قيمة  $P = 0.432$ ) ، والعمر (قيمة  $P = 0.001$ ) ، تولد (قيمة  $P = 0.000$ ). كان هناك اثنين من أجناس القراد التي تم تحديدها والتي كانت هيالوما ورايبوسيفالوس. أنواع الجنس من هذين النوعين هي *H. rufipes* و *H. dromadarii* و *H. implitatum* و *H. anatolicum* و *R. evansi*. في الختام ، فإن المرض منتشر في الولاية الشمالية.