Haematological alterations associated with *T. Evansi* load in naturally infected camels in Sokoto

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ABSTACT

This study was conducted to determine the haematological alterations associated with Trypanosoma evansi load in naturally infected camels in Sokoto central abattoir, Sokoto State, Nigeria, between May and July, 2012. The prevalence of *T. evansi* was determined using wet blood film and stained thin and thick blood smear films. Herbart and Lumsden rapid matching method was used to convert the amount of parasitaemia observed microscopically from per field to per mill of blood samples. Haematological values were obtained using ERMA® INC. particle counter. The mean values for PCV [%] and RBC [x10⁶/ul] were significantly lowered in infected camels, while Hb [g/dl], WBC [x10³/ul] and PLT [x10³/ul] values of infected camels were relatively higher [significantly] than those of non-infected. Results revealed inverse and direct correlations of parasitaemia with Packed Cell Volume [PCV] and Red Blood cells Count [RBC] [p<0.01], and White Blood cells Count [WBC] [p<0.05] respectively. However, no association existed with haemoglobin [Hb] and platelets [PLT] values of infected camels. Trypanosoma evansi infection usually results to anaemia in camels, therefore an urgent step have to be taken to avert this threat.

INTRODUCTION

*Trypanosoma evansi* infects a wide host range among domesticated animals; it affects camels, water buffaloes, cattle, sheep, goats, horses, donkeys, the Indian elephants, dogs, cats and pigs [1]. The hosts vary between the geographical regions, in Africa camels are the most important hosts [2]. A protozoan parasite [*T. evansi*] is the causative agent of Trypanosomosis in camels [3]. Infection with *T. evansi* presents a diverse range of symptoms in the susceptible mammalian hosts, including anaemia, pale mucosal tissues, generalized oedema, spleenomegaly, liver and renal hypertrophy [4], and abortion [5]. The infection may be acute or chronic [3].

Trypanosome spp that affect man and animals have been subdivided into two groups, the *T. brucei* group of trypanosomes [*T. brucei, T. b. gambiense, T. b. rhodesiense and T. evansi*] mostly invade tissues [humoral] whereas, *T. congolense* and to a lesser extent *T. vivax and T. cruzi* predominantly restrict themselves to the blood circulation [haemic] [6;7]. Because of their presence in the blood, these invading parasites produce numerous changes in the cellular and biochemical constituents of blood [8]. Infection with *T. brucei* group causes red blood cell destruction which results in anaemia as well as tissue damage [9]. The mechanism or pathophysiology of anaemia in trypanosomosis is complex and multi-factorial in origin [10]. It initiates a cascade of events leading to haemolytic anaemia and cardiovascular collapse [11].

Blood parameters are essential indicators of health status in animals and they are invaluable in diagnosis, treatment, or progress of many diseases [6]. Several changes in the haematology and biochemistry of the blood of haemoparasitised camels may take place. The Packed Cell volume [PCV] is most frequent test used to determine the functional state of erythrocyte [7]. Other tests such as the Red Blood cell Count [RBC] and concentration of Haemoglobin [Hb] gives the number of circulating erythrocytes and their oxygen carrying capacity respectively [7]. Trypanosomosis in camels is an important disease, widely distributed in tropical and sub-tropical regions. It is characterized by high mortality and morbidity and also anaemia which have been recorded as a consistent finding in infected animals. Despite the importance and world wide distribution of *T. evansi*, very little is known about its
pathogenesis. Moreover, there are no studies about the disease in camels with the Sokoto isolate of the parasite. This study aimed to investigate some haematological alterations in camels naturally infected with Sokoto isolate of *T. evansi* and to relate such alterations with the parasite load.

**MATERIALS AND METHODS**

Blood samples from two hundred [200] camels at Sokoto central abattoir were collected using EDTA bottle at the point of slaughter. The samples were immediately transported to Parasitology Laboratory of Biological Sciences Department, Usmanu Danfodio University, Sokoto. Demonstration of trypanosomes in blood was done using Conventional Parasitological Techniques [CPT], which includes; wet blood films, Giemsa stained thin and thick blood smears [12]. Parasitaemia was measured using a light microscope and the parasite were counted per field and then later converted in to per millilitres [ml] of blood using Rapid Matching Method of Herbert and Lumsden [13]. The data obtained was subjected to statistical analysis using SPSS [version 16]. Chi-square and ANOVA were used to compare mean values of Packed Cell Volume [PCV[%]], Haemoglobin [Hb[g/dl]], Red Blood cells Count [RBC[x10^6/ul]], White Blood cells Count [WBC[x10^3/ul]], and Platelets [PLT[x10^3/µl]] of infected and uninfected camels, and Pearson correlation was used to determine the correlation between haematological parameters and parasite load.

**RESULTS**

Results revealed a 31.5% infection rate among the sampled camels with a mean parasite load of 46.33±5.79/field [4.42x10^7/ml].

<table>
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<tr>
<th>WET MOUNT</th>
<th>THICK BLOOD SMEAR</th>
<th>THIN BLOOD SMEAR</th>
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<tbody>
<tr>
<td>Mean</td>
<td>1.6x10^7</td>
<td>2.01x10^7</td>
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<td>Median</td>
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<td>Minimum</td>
<td>1</td>
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<td>Maximum</td>
<td>72</td>
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The range for PCV [%] values of the infected camels was 10.8 to 30.5 with mean value of 19.78%, Hb [g/dl] was 6.3 to 14.2 with a mean of 9.89, RBC [x10^6/ul] was 2.8to 9.5 with mean value of 6.16, WBC [x10^3/ul] was 9.2 to 30.6, with mean of 18.74 and the range for PLT [x10^3/µl] values of infected camels was 80.0 to 356 with mean of 195.17. For non-infected camels, the PCV [%] range was 10.8 to 30.1 with mean value of 23.24%, Hb [g/dl] was 3.0 to 14.80 with the mean of 10.26, RBC [x10^6/ul] was 2.8 to 9.0 with mean of 7.10, and lastly, WBC [x10^3/ul] was 7.90 to 39.90 with mean of 17.26 and PLT [x10^3/µl] values range from 36.0 to 352 with mean of 193.66.

The mean values of PCV [%] and RBC [x10^6/ul] was relatively lower in infected camels as compared to non-infected, and the difference between them was statistically significant [P < 0.01]. However, WBC [x10^3/ul], Hb [g/dl] and PLT [x10^3/µl] values of infected camels were relatively higher than those of the non-infected camels [Table 1]. The difference in the mean values of Hb [g/dl] level between infected and non-infected camels did not attain significant level [P > 0.05], the difference in WBC [x10^3/ul] was statistically significant [P < 0.01].

Results of this study indicated parasite load to vary inversely with PCV [%] r= -0.342 and RBC [x10^6/ul] r= -0.336 and directly with WBC [x10^3/ul] r= -0.180. However, no association was found with PLT [x10^3/µl] r= -0.074 and Hb [g/dl] r= 0.044 in the infected animals.
DISCUSSION

Signs of illness caused by infection with *T. evansi* have been described, among them include anaemia, oedema, paralysis of the hind limbs, infertility, among others. Anaemia is one of the major signs of trypanosomosis infection as stated by many researchers which is also confirmed in this study. This is caused by the destructive action of *T. evansi* against red blood cells [9] which result to the reduction in PCV level. The onset and severity of anaemia in trypanosomosis is directly related to the appearance of the parasite in blood and the level of parasitaemia [14]. The mechanism of pathogenesis in anaemia among infected animals is of variable in nature. Haemodilution, osmotic and mechanical fragility of RBCs, extravascular haemolysis, decrease life span of RBCs and dyshaemopoiesis all have been discussed by various research workers as pathogenic mechanisms in different animals [14; 15; 16]. Additionally, it was shown that RBC’s of animals infected with *T. evansi* show increase osmotic fragility. Erythrocyte fragility is the susceptibility to haemolysis when erythrocytes are subjected to a hypotonic medium. This condition defends on the membrane and the functional status of RBC’s. Besides, for each erythrocyte, osmotic fragility defends on the relationship between surface and volume, considering that due to their biconcave shape, erythrocytes can accept without causing haemolysis, a water inlet capable of increasing its volume up to 70%. One this limit is exceeded, haemolysis occurs. This fragility of erythrocytes of animals experimentally infected with *T. evansi* could be explained in part by the direct attack of ROS on the erythrocytes plasma membrane.

Our findings revealed significant lower PCV and RBC values in the infected camels, which is consisted with previous findings of [17;18] using camels and horses infected with *T. evansi*. Reduction in PCV and RBC values may result to anaemia. As proposed by [19], anaemia is caused by mechanical injury to erythrocyte by the lashing action of the powerful locomotory flagella and microtubule reinforced bodies of the millions of the organisms [*T. evansi*] during parasitaemia. [19] and [20] also reported that the severe anaemia may be as a result of chronic liver inflammation, which causes depression of erythropoiesis. In addition to this, anaemia was found to be inversely proportional to worm load [21], which is in line with the findings of [22], who reported that there is a good correlation between the level of infestation and erythrocyte numbers, packed cell volume, haemoglobin concentration and plasma protein values. Hence, [23] noted a decline in PCV in sheep with increase in parasitaemia and its recovery with disappearance of parasite.

The mean values of WBC in infected and uninfected camels differs significantly [P < 0.05] were mean values of infected are higher then those of uninfected camels. This indicates the there’s increase in antibodies in response to the infection.

Correlation analysis indicates that as parasite load increases, WBC also increases. These occur as a result of immune response to the infection there by producing more antibodies to fight against the infection which will result to the increase in WBC. Contrary to the report of [4] who report that there was no differences between infected and control animals. Ogbaje et al. [2010] also indicates that, there was no statistical significant difference [p>0.05] between the values of the infected and uninfected goats throughout the period of the experiment. This difference may be because of the ability of goats to be trypanotolerant to the infection. In this study we found that this difference was as a result of camel’s inability to tolerate the disease.

CONCLUSION

From the present study, it was concluded that *T. evansi* infection in camels to cause distortion in haematological parameters of the host which result to a prominent sign of the infection [anaemia] due to the reduction in PCV and RBC values, which decrease with increase in parasite load. The degree of changes in haematological parameters depends sorely on the number of trypomastigote found in the blood of an infected animal. Therefore early diagnosis will help immensely to avert this menace, because camels are very essential as source of meat, hide and skin, used in agricultural purposes and for transport and conveyance of farm products must especially in rural areas of northern Nigeria.

REFERENCE


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