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PREVALENCE OF CAMEL TRYPANOSMIASIS AND ITS EFFECT ON PCV AS HEALTH INDICATOR

نسبة حدوث مرض الجفار وتأثيره على مكداس الدم(PCV) كمؤشرلصحة الإبل

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المستخلص

يعتبر مرض الجفار من أخطر الأمراض ذات الأهميه الاقتصاديه الخاصه في السودان. تبحث هذه الورقه في تأثير هذا المرض على مكداس الدم (PCV%) ضمن بحوث أجريت لمعرفة انتشار المرض في مناطق تواجد الإبل في أنحاء السودان المختلفه . استخدم عدد 894 راس من الابل في هذه الدراسه التي اهتمت بأثر الاصابه بالجفار و الأثر الموسمي على مدى ومتوسط مكداس الدم (PCV%). سجلت الجمال المصابه قياسات أقل وذات دلاله احصائيه معنويه عاليه ($p<0.01$) مقارنة بالجمال الخاليه من المرض، أما موسمياً فليس هناك فرق معنوي ($p>0.05$). خلصت الدراسه الى أنَ قياس مكداس الدم (PCV %) يمكن أن يستخدم كمؤشر لإصابة الإبل بالجفار خاصة في المناطق التي ينتشر فيها هذا المرض، وهذا قد يساعد في استراتيجية مكافحة المرض بترشيد استخدام الأدويه المعالجه للجفار كطريقه أساسيه للمكافحه مما يقلل من فرص انتشار مقاومة الطفيل للأدويه.

Abstract

Trypanosomosis (Guffar) is ranked as a major threat to camel industry. This paper reports the effects of trypanosomes on camel packed red cell volume (PCV) as depicted from field surveys to determine the prevalence of camel trypanosomosis in the Sudan. The PCV values of 894 examined

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camels were recorded. Thereafter, the range and the mean PCVs of infected and non-infected camels were determined. The effects of seasonal variation as well as the effects of trypanosomes in PCV values were also evaluated. The mean PCV value of parasitologically infected individuals was found to be significantly ($p<0.01$) lower than that of non-infected. Seasonal variations have no significant effect ($p>0.05$) on PCV.
It was concluded that the degree of anaemia as estimated by PCV, can be used as indicator for camel trypanosomosis of herds in risk areas in the Sudan. This is may be helpful for strategic and effective use of trypanocides in trypanosomosis control. This may also reduce the distribution of drug resistant strains.

Key words: Anaemia, PCV%, *T. evansi*, Control, Camel, Sudan.

Introduction

Anaemia is regarded as the main pathological feature of trypanosomosis (Ikede *et al.* 1977; Ismail 1988 and Rahman *et al*. 1997). In most instances, PCV alone is used to determine the degree of anaemia. Higgins (1986) reported the range of normal camel PCV to be 24% to 42%. Similar studies, however, on small number or in a few camel herds were conducted in the Sudan by Salaheldin *et al*. (1979) and, Musa and Mukhtar (1983). The latter authors reported a mean PCV of 30.0% with a range of 25-34% from 96 Sudanese camels in Tambool area. More recently, the effect of camel age on PCV values was recorded by Omer *et al.* (2006). They reported PCV% of 26.69±3.25 for suckling calves and 24.87±2.63 for weaned calves. Seasonal variations on the haematological values of 100 camels had been recently reported by Nawal *et al.* (2006). The haematological studies carried out so far on the camel-in their natural pasture- in the Sudan are far from being complete. More baseline data is needed on the haematology of normal and infected camels.

Parasitic infections especially trypanosomosis are one of the major constraints hindering camel industry in the Sudan (Mahmoud and Gray 1980; Losos 1986; Shommein and Osman 1987; Majid 1998). A prevalence of 2.04%, and 1.12% in Gedarif and Kassala were reported by Dafalla (1988). Although anaemia is not itself pathognomonic it remains, however, one of the most important indicators of animal trypanosomosis (Demeke 2003). The ability of trypanosome-infected animal to control development of anaemia is a criterion of trypanotolerance and is

measured by the PCV levels (Trail *et al.*, 1992). A warning was foreseeable the moment diminishing PCV values reached 23% in cattle (Mbwambo *et al.*, 2007), so effective treatment at this stage of PCV will help the animal to maintain productivity. Finally, close follow-up of the trend of PCV, level of parasitaemia and productivity will allow for strategic and effective use of trypanocides in trypanosomosis control (Mbwambo *et al.*, 2007). They also use PCV values of less than 25% as indicator to improve the sensitivity of mouse inoculation technique. This paper reported the prevalence of "Guffar" in geographically different areas in the Sudan during which the range and mean±SD of PCV values of infected and non-infected camels were recorded and compared for significances. The use of PCV as an indicator for camel trypanosomosis in the Sudan was discussed.

Materials & Methods

Animals and area of the study: A total of 894 one humped camel (*Camelus dromedariu*s) were sampled. Of these, 271 head from Kassala, 297 from Gedarif, 69 from River Nile, 147 from Khartoum and 110 head from Kordofan were examined during wet and dry seasons in the Sudan. The owners were asked to bring all their camels for examination and treatment with quinapyramine sulphate (antrycide Rhone-Merieux, France) and Ivermectin injection (Panmectin®, Pantex Holland B.V.).

Blood Samples: Tow heparinised capillary tubes (7.5×1.5mm) were filled with blood (about 70µl) from each camel ear vein puncture. A drop of blood was placed on microscopic slides, covered with coverslip (22×22mm) and examined under microscope for the presence of the motile trypanosome or/and microfilaria using ×10 eye piece and ×40 objective lenses. The capillary tubes were then sealed at one end with "plasticel" and centrifuged using haematocrit centrifuge (SH 120, Shanghai Surgical Instruments factory) for four minutes at 12000 revolutions per minute (rpm). The PCV was recorded using haematocrit reader (Shanghai Surgical Instruments Factory) and then the buffy coat was examined for parasites following the method of Murray *et al.* (1977).

Faecal samples: Concurrently with the blood samples, faecal samples were also collected directly from the rectum of (131) camels in clean polythene bags. A drop of 10% buffered formalin was added for

preservation. Using both floatation and sedimentation techniques, faecal samples were examined for gastro-intestinal parasite infection.

Parasite speciation: Blood smears were also made from positive animals, air-dried, fixed with methanol and stained with Giemsa. These slides were later examined for parasite speciation using ×10 eye piece and ×100 objective lenses.

Statistical analysis: Comparison of the PCV values between the two seasons and between the trypanosome infected and noninfected camels were statistically analyzed using Student "t".test.

Results

The prevalence of camel trypanosomosis: Number of camels examined and the prevalence of camel trypanosomosis in this study were presented in the following table:

Table 1: Prevalence rate% of camel trypanosomosis in the different states:

Area	Total No.	No. of +ve	No. of -ve	Prevalence%
Kassala	271	5	266	*1.85*
Gedarif	297	12	285	*4.04*
River Nile	69	0	69	*0.00*
Khartoum	147	2	145	*1.36*
Kordofan	110	3	107	*2.73*
Total	894	22	872	*2.46*

Out of 894 camels examined in the three regions, 22 camels were found infected and hence constitute a prevalence rate of 2.46% in the total areas surveyed. Region wise, as shown in table (2), the eastern region (Kassala & Gedarif) showed the highest trypanosomosis prevalence rate (3%), followed by Kordofan region (2.73%). The central region (Khartoum & River Nile) had lowest prevalence rate (0.93%).

Table 2: Trypanosomosis prevalence rate% in camels in the different regions:

Region/Sudan	Area	Total No.	No. +ve	Prevalence %
Eastern	Kassala&Gedarif	568	17	2.99
Central	Khart. & R. Nile	216	2	0.93
Western	Kordofan	110	3	2.73

PCV values in non-infected camels: In parasitologically healthy camels, there was insignificant difference ($p>0.05$) between PCV values during wet and dry season despite the elevated PCV during the wet season. This possibly indicates that the season has no major effect on the PCV value as presented in table 3 below.

Table 3: Mean±SD PCV values and range of non-infected camels (t".test):

Area	Dry season (PCV%)		Wet season (PCV%)		Significance
	Mean±SD	Range	Mean±SD	Range	
Kassala	25.0±3.3	20-35	26.6±2.5	20-33	**NS**
Gedarif	24.4±3.6	20-36	25.0±3.3	20-35	**NS**
Khartoum	23.1±3.2	20-31	ND		-
River Nile	23.1±3.4	20-33	ND		-
Kordofan	ND		22.0±2.8	20-28	-

NS ≡ not significant (p>0.05).

PCV values in infected camels: Similarly, as shown in table 4, there was no significant difference ($p>0.05$) between PCV values during wet and dry season. This again confirms that season has no effect on PCV values.

Table 4: Mean±SD PCV values and range of the infected camels:

Area	Dry season (PCV%)		Wet season (PCV%)	
	Mean±SD	Range	Mean±SD	Range
Kassala	18.7±o.6	18-19	20.0±2.8	18-*22
Gedarif	18.3±2.1	16-*21	20.0±4.6	16-*25
Khartoum	17.5±0.7	17-18	ND	
Kordofan	ND		18.0±1.0	17-19

**Only one animal revealed PCV of more than 20%.*

About 80% of the infected camels had PCV lower than 20% (17.8±1.1). The mean PCV of all infected camels (18.33±0.33) is also less than 20%. Most of the camels that were not infected with trypanosomes and had PCV values less than 20%, were found to be infected with gastro-intestinal parasites particularly *Haemonchus longistipes*. Some *Fasciola spp* and *Schistosoma spp* were also demonstrated. It worth mentioning that, microfilariae were not detected in all investigated camels. Table (5) below compares the mean (±SD) PCV% values of all healthy camels examined during the survey (24.13±1.03) with the mean(±SD) PCV% values of all infected camels (18.33±0.33). The infected camels in all regions showed highly significant ($p < 0.01$) lower PCV values during both wet and dry seasons compared with the healthy camels. Detailed comparison was presented in table (6).

Table 5. Comparison between mean PCV of healthy and infected camels using t".test:

Camels	Mean±SD	Significance
Noninfected	24.13±1.03	**
Infected	18.33±0.33	

*** ≡ significant at ($p<0.01$).*

The table 6: showed detailed comparison between infected and healthy camels during dry and wet season:

	Dry season		**Wet season**	
	Non-infected	**infected**	**Non-infected**	**infected**
Kassala	25.0±3.3	18.7±o.6	26.6±2.5	20.0±2.8
Gedarif	24.4±3.6	18.3±2.1	25.0±3.3	20.0±4.6
Khartoum	23.1±3.2	17.5±0.7	ND	
Kordofan	ND		22.0±2.8	18.0±1.0

Discussion

The present study revealed prevalence of 2.5% in all camel zones surveyed. However, eastern region showed higher prevalence rate compared to western or central regions. This may be only due to the higher number of camels examined in the two areas (Kassala & Gedarif) of eastern region. Lower incidences of 2.04%, and 1.12% in Gedarif and Kassala were reported by Dafalla (1988). Mohamed *et al.* (2006) reported a decrease of PCV values post experimental infection with *T. evansi* in Sudanese camels. They also mentioned that the PCV values increased post treatment. In this study, the range of PCV of healthy camel was found to be within the ranges reported by several authors such as Salaheldin *et al.* (1979), Musa and Mukhtar (1983), Higgins (1986), Majid, *et al*. (2002) and Omer *et al*. (2006). However, the mean PCV of the non-infected camels in our study was found to be lower than that reported by Salaheldin *et al*. (1979). This may be because of the incomparable number of camels that we sampled from different geographic areas. Additionally, their animals were housed in experimental shade and given food and water *ad lib*. In contrast, the present data were collected from camels in their natural habitat. In the present study, anaemia as measured by PCV values was found to be a reliable indicator for camel trypanosomosis. The PCV of the infected camels was significantly ($p<0.01$) lower than the non-infected animals and not affected by seasonal variation. Similar observations were recorded by Yagoub (1989) and Demeke (2003) in the Sudan and in Ethiopia respectively. The results of this study were also in agreement with the observations of Yagoub (1989) on the possible association of helminthes infection with the low PCV in camels. PCV values in the low range of

(14%-19%) were also reported in this study from camels that were neither positive for trypanosomes nor for detectable egg worms. This may be due to the continuous haemolysis observed following trypanosome infection even when trypanosomes are eliminated (Ikede *et al.* 1977). Anaemia is primarily due to the excessive haemolysis in addition to the increased erythrocyte fragility (Ikede *et al.* 1977; Ismail *et al.* 1985; Ismail 1988 and Ibrahim 2006). Our results indicate no seasonal significant ($p>0.05$) differences in the PCV values in both, infected or healthy camels. This was agreed with Nawal *et al.* (2006) who found that no any environmental changes on the PCV values of healthy camels during dry summer and wet season. The present study emphasized that the change in PCV is more drastic during trypanosome infection as compared to environmental changes. As trypanosomosis is a herd problem, the PCV profile can be used to indicate differences in disease challenge or treatment response. From the present study we concluded that, PCV values of less than 20% may be used as indicator for camel trypanosomosis in surveys and control of herds at risk in the Sudan.

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