Equine trypanosomosis in the Central River Division of The Gambia: a study of veterinary gate-clinic consultation records

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1. Abstract

The objective of this study was to provide epidemiological information of equine trypanosomosis in the Central River Division (CRD) of The Gambia. Therefore, 2285 consultations records of equines, admitted in a gate-clinic at Sololo in CRD, were studied retrospectively. The data were recorded in the period between September 1995 and July 2002 and comprised consultations of 2113 horses and 172 donkeys.

'Trypanosome infection' was the most frequently diagnosed condition and accounted for 61% of the cases. Horses were more frequently diagnosed with trypanosome infections than donkeys (p

<0.001), with an occurrence of 63% compared to 43% in donkeys. In both horses and donkeys, trypanosome infections were mainly due to *Trypanosoma congolense* (64%) and *T. vivax* (32%). There was no difference observed in the occurrence of trypanosome infections in male or female donkeys (p=0.585), but there were more female (67.8%) horses observed with trypanosome infections than male horses (60.7%; p=0.003). There was no difference observed in the occurrence of trypanosome infections in donkeys older or younger than 1 year (p=0.130), but more older horses (63.2% >1 year) were observed with trypanosome infections than young horses (54.5 %< 1 year; p=0.033).

The number of donkeys and horses with trypanosome infections decreased during the rainy season (June-September).

The majority of equines that were admitted with trypanosome infections were severely anaemic. The average packed cell volume (PCV) declined with increasing parasitaemia (p= 0.006).

Seventy four percent of the farmers' predictions of trypanosome infections in their equines were confirmed by darkground-microscopy. That proved that farmers had a fairly accurate knowledge of the diseases affecting their equines.

The treatments executed at the gate-clinic were generally effective. The few (0.4%) relapses of the *T. vivax* infections that were previously treated with diminazene aceturate in this study were not sufficient to prove drug resistance.

The study showed that the analysis of consultation records at a gate-clinic can provide complementary information to conventional epidemiological studies in the same research area.

Key-words: Trypanosomosis, Equines, Gambia, Epidemiology, gate-clinic, prevalence

2. Introduction

Horses and donkeys play an important role in developing countries for animal traction (Sumberg & Gilbert, 1992). In The Gambia, the use of equine traction has grown rapidly (Sowe *et al.*, 1987; Loum & Mbacke, 1989; Snow, *et al*., 1996; Faye *et al*., 2001, Secka, 2003). In 1987, Sowe *et al.* indicated that the equine population in The Gambia was not self-sustaining as the high mortality and low foaling rates required sizeable purchases of donkeys and horses from neighbouring countries. The authors stressed the need to identify the key determinants of this high mortality and poor reproductive performance and recommended that populations of horses and donkeys in districts with high mortality rates should be screened for trypanosomosis or signs of other diseases (Sowe *et al.*, 1987). Trypanosomosis is one of the most important conditions affecting livestock productivity in The Gambia and equines are very susceptible (Snow *et al*., 1996, Starkey, 1990). There have been few reports on the prevalence of equine trypanosomosis in The Gambia (Loum & Mbacke, 1989; Mattioli *et al*., 1994; Faye *et al*., 2001). The figures given by the different authors were based on small animal numbers and were rather divergent. For example, the prevalence of trypanosomosis in equines, reported by Loum & Mbacke (1989) was 5.5%, compared to the prevalence of 45.5% in horses, and 17.1% in equines, given by Faye *et al*. (2001) (Table 1).

In the present wording, there is an increasing need for uncomplicated, reliable and cost-effective methods for collecting information required to develop policies for animal health care. However, as illustrated in table 1, due to restricted financial resources or time constraints, samples sizes in conventional epidemiological studies are often limited, resulting in difficulties in interpretation and statistical analyses.

This study makes use of existing data of consultations of equines at a veterinary gate-clinic in The Gambia and endeavours to provide epidemiological information of equine trypanosomosis in a cost-effective manner.

3. Materials and Methods

3.1 Study area

The study was carried out at Sololo in the Fulladu West district (13°27'N, 14°41'W) in Central River Division (CRD) of The Gambia, 320 km from the coast. The area is predominantly infested with the tsetse fly *Glossina morsitans submorsitans*, which is the major vector of trypanosomosis in The Gambia and is mainly found in dry, canopied, savannah woodland. *Glossina palpalis gambiensis* also occurs but is more restricted to riverine vegetation. The region is ranked as an area of low to moderate tsetse challenge (Rawlings et al., 1993).

In 1987, 16% of the families in CRD-south owned horses and 53% owned donkeys (Sow, et al. 1987), used for agricultural activities or transport of goods and people.

3.2 Gate clinic at Sololo

In 1995, the International Trypanotolerance Centre (ITC) at Sololo established a veterinary gate-clinic with the purpose to optimise relations between ITC and the farmers. During the preceeding research activities of the ITC in the surrounding villages of Sololo, a strong need for veterinary health care emerged. The establishment of the gate-clinic, therefore, was demand-driven and was also esteemed to provide valuable long term information of prevalent livestock diseases in the referral area.

Since September 1995, farmers brought sick animals for diagnosis, treatment and recording of epidemiological information to the gate-clinic at Sololo. The farmers were responsible for transport and treatment costs. Veterinarians or livestock assistants allocated diagnosis and

101 treatments. Livestock assistants had at least two years of training in animal health care several
102 years of practical field experience in livestock research and development.
103
104 ***3.3 Data collection and analysis:***
105
106 Records on 2285 equines that had been admitted at the gate clinic between September 1995 and
107 May 2000 and from July 2001 until July 2002 were analysed. They contained the following
108 parameters: date, owner name, species, origin, animal, age (younger or older than 1 year), case
109 history, observations, diagnosis and treatment. Figure 1 shows the origin of horses that were
110 admitted at the gate-clinic.
111
112 Jugular vein blood samples were collected routinely from all equines, using ethylenediamine tetra-
113 acetic-acid (EDTA)-coated vacutainer tubes. The blood samples were examined by the capillary
114 micro-haematocrit centrifugation method to estimate the packed cell volume (PCV) as an indicator
115 of anaemia. After determination of the PCV, the buffy coat was examined by phase contrast or
116 darkground microscopy (DG) (Murray *et al*., 1977) at a magnification of 100-400 ×, to determine
117 trypanosome parasitaemia. Between 50 and 100 fields were examined per sample. Parasitaemia
118 was scored using the method of Paris *et al.* (1982).
119 Of all the equines found with trypanosome infections, 1214 were treated with diminazene
120 aceturate at a dose of 3.5 mg / kg, administered (i.m.). This dose was split into 2 or 3 aliquots with
121 4 hours apart when the equine was anaemic and/or showed a high parasitaemia. The dose was
122 given all at once when the horse was in good condition.
123 The other 182 equines infected with trypanosomes were treated with isomethamidium chloride at a
124 dose of 0.5 mg / kg (i.m.), or with homidium bromide at a dose of 1 mg / kg (i.m.).
125

3.4 Statistical methods

All data were processed using Microsoft Access database, version 7 and analysed using the statistical package: Stata 8.0 (Stata Corp., College Station, TX; USA). Disease frequencies were expressed as prevalence point estimates without confidence intervals; no extrapolation from the sample to the equine population in the region was attempted. Pearson Chi^2 tests were used to compare the occurrence of trypanosome infections in the different species; age and sex classes. A Spearman Rank correlation was used to analyse dependency between the PCV and parasitaemia scores. The level of significance was set to $p<0.05$.

4. Results

4.1 Occurrence of trypanosomosis in equines in CRD-south

The 2285 equines admitted at the gate clinic consisted of 2113 horses and 172 donkeys. Of all the equines admitted at the gate-clinic, 61% had trypanosome infections (Table 2). Horses (63%) were more often affected by trypanosome infections than donkeys (43%; $p < 0.001$). In both horses and donkeys, trypanosome infections were mainly due to *T. congolense* and *T. vivax.* *Trypanosoma brucei* was seldom detected, and was mainly found in mixed infections with *T. congolense* and *T. vivax.*

Fifty two female and 120 male donkeys; 544 mares and 1569 stallions were admitted during the research period. There was no difference in the occurrence of trypanosome infections in male or female donkeys ($p=0.585$), but there were more female horses observed with trypanosome infections than male horses ($p=0.003$). Ten and 162 donkeys were admitted which were respectively younger and older than 1 year. The horses were divided in 154 horses in the younger than 1 year class, and 1959 horses in the older than 1 year class. There was no difference observed

in the occurrence of trypanosome infections in donkeys older or younger than 1 year (p=0.130), but there were more older horses (> 1 year) observed with trypanosome infections than young horses (< 1 year; p= 0.033).

4.2 Seasonal distribution of trypanosomosis in equines in CRD-south

There was a decline in the occurrence of donkeys and horses admitted with trypanosome infections during the rainy season of June-September (Figure 2).

All trypanosome species were found less frequently during the early rainy season. Peak occurrence of *T. congolense* was observed in the late dry season (February-May), and peak occurrence of *T. vivax* was observed in the early dry season (November-December).

4.3 Correlation between Packed Cell Volume and DG-score

The majority of equines admitted with trypanosome infections were severely anaemic. At times, horses with PCV values below 10% (normal range in Gambia 20-40%). Figure 3 shows the negative correlation (Spearman's Rho = -0.074, p>|t| = 0.006) between mean PCV and the parasitaemia score.

4.4 Accuracy of owners' diagnosis

The positive predictive value of the owners' general assessment of "sick", when using the gate-clinic examination as a gold standard, was 93.0%. The positive and negative predictive values of the owners assessment of trypanosomosis ('Daso' or 'Toy' in Mandinka or Wholof respectively), when using the darkground microscopy as a gold standard were 74.6% and 77.9% respectively.

Most owners claimed that the disease started only a few days before the time of consultation. Different symptoms were observed, ranging from minor weight loss to serious emaciation; from slight oedema of the genitalia to oedema of the whole thorax, abdomen, genitalia and legs; from minor loss of appetite to anorexia and from a little dreary to total paresis.

4.5 Effectiveness of treatments

Of all 1214 patients treated with diminazene aceturate, less than 1 % returned to the gate-clinic within a period of a month. In 5 blood samples of the 12 returning patients (or 0.4 % of the patients previously treated with diminazene aceturate), a relapse of *T. vivax* was found during DG-microscopy in less than 2 weeks post-treatment. One horse (or 0.1 % of the patients previously treated with diminazene aceturate), returned with a *T. vivax* infection, 27 days after being treated against a *T. congolense* infection. The other returning patients previously treated with diminazene aceturate were found negative during DG-microscopy. No anaphylactic reaction subsequent to the intramuscularly diminazene aceturate treatments in equines were observed.

None of the patients treated with isomethamidium chloride or homidium bromide returned with trypanosome infections within a 3 months period. No anaphylactic reaction subsequent to the intramuscularly injected homidium bromide or isomethamidium chloride treatments in equines was observed.

5. Discussion

The equine population sample was not randomly selected but merely dependent upon the farmers' decision. Sub-clinical trypanosome infections or other diseases of minor economic importance (which were self-curable or which did not need intervention of veterinary assistance) were

probably not considered by the farmers. Therefore, the results of the gate-clinic records cannot be directly extrapolated to the source population of all equines in the study area.

However, in the database of 2285 veterinary consultations of equines in a tsetse-infested area, certain trends in the occurrence of trypanosome infections were observed which corresponded to the more conventional epidemiological studies on the same topic.

There were more horses with trypanosomosis admitted at the gate clinic than donkeys (2113 horses versus 172 donkeys). This was likely due to the fact that farmers value donkeys less than horses, and might therefore be less willing to pay for their treatments or invest time to bring them to the gate clinic. Furthermore, trypanosomosis was more frequently diagnosed in horses than in donkeys. This observation corresponds with previous conventional research reports that donkeys seem to be less susceptible to trypanosomosis than horses (Maclennan *et al*., 1970; Barrowman *et al*., 1991 and Faye *et al*., 2001, Secka, 2003).

Trypanosome infections occurred less in young or male horses. This trend, however, was not noticed for donkeys in this study, nor was any age or sex specificity of trypanosome infections observed in equines in previous studies in the same area (Secka, 2003). That might have been due to the relatively small group of donkeys that was examined in this study and the small equine sample sizes in previous longitudinal studies in the same area.

Trypanosoma congolense infections were the most common in both horses and donkeys, followed by *T. vivax; Trypanosoma brucei* was rarely detected. These findings are again in agreement with results of previous conventional studies on equines in the area (Mattioli *et al.*, 1994; Faye *et al.*, 2001, Secka, 2003) and might be explained by the virulence of *T. brucei* in equines. The development of disease due to *T. brucei* is often acute in equines, and can cause a sudden death. *Trypanosoma congolense* and *T. vivax* usually cause more chronic infections with progressive anaemia and weakness (MacLennan, 1970, Stephen, 1970, Kaufmann, 1996).

A decline in the occurrence of trypanosome infections in equines was observed during the rainy season. Peak occurrences of *T. vivax* and *T. congolense* in horses were observed in the early and late dry season respectively. Also the peak prevalence of trypanosomosis in cattle of the same area (Wacher *et al*., 1993; Fall *et al.,* 1999), occurred in the mid to end of the dry season and followed the period of maximum tsetse density with a lag of 2 - 3 months. This pattern has been predicted in simple trypanosomosis infection models (e.g. Leak, 1993; Milligan and Baker, 1988).

Additionally, at the end of 2003, an inquiry using the Participatory Epidemiology-methodology (Mariner, 2000; Catley and Leyland, 2001, Catley *et al*., 2001, 2002) was executed in the villages that appeared most often in the database (Dhollander, 2003, not published). The exercise 'seasonal calendar' in these villages revealed a decline in trypanosomosis cases in the rainy season. That means that according to the owners' perceptions, there are fewer cases of trypanosomosis during the rainy season. It is therefore not likely that the decline in trypanosome infections during the rains indicated that the owners have less time to bring their equines to the gate-clinic due to time-consuming farming activities.

In addition, the owners showed a good knowledge of diseases affecting their equines. Three in 4 predictions of the farmers of trypanosomosis were confirmed positive by DG-microscopy. By using a diagnostic test with higher sensitivity, this figure might have been even higher.

The horses and donkeys with trypanosome infections were admitted at all kind of stages of the disease, as shown by the divergent observations of symptoms at the gate-clinic. The owner's estimation of duration of the disease, therefore, might often have been underestimated, or, the owners might have been reserved to tell that disease was noticed since long.

Finally, the treatments executed at the gate-clinic were generally effective. Patients with trypanosome infections were mostly treated with diminazene aceturate due to the readily availability of the medicine in the Gambia and its affordable price for the farmers. The few (0.4%) relapses of the *T; vivax* infections that were previously treated with diminazene aceturate in this

study are not sufficient to prove drug resistance. Standardised tests in controlled circumstances are needed to make such assessments. Moreover, the figures were based on the assumption that the patients, which did not return to the gate clinic after treatment, survived and were cured. Although the patients, admitted in critical conditions, were taken in for observation until their PCV values were normalized and the parasitaemia was zero; and the farmers had no other veterinary service in the area to go to, it might have been possible that some patients did not survive the treatments or the farmers did not return to avoid a 'second investment'. Therefore, the effectiveness of the treatments might have been overestimated.

At any rate, to avoid future resistance of the medicament in the research area, it is highly advisable to alternate the diminazene aceturate treatments more with treatments with other trypanocides available on the market.

6. Conclusions

Information of equine trypanosomosis gained from the analysis of data based on the active seeking of local farmers for veterinary assistance, was highly complementary to other conventional studies on the topic in the same area.

The study further demonstrated the good skills of the farmers to recognise trypanosomosis in equines and gave additional information on the effectiveness of drugs used to treat trypanosome infections.

An advantage of the approach used was the low additional cost needed to carry out the study, compared to most conventional epidemiological studies, since farmers paid for the transport, diagnosis and treatment costs. The extra cost and time needed concerned only the recording of the veterinary consultations and the data analysis. Consequently, this study could have been carried out for a longer period than most conventional studies. Furthermore, the high demand for

veterinary services in the area resulted in much higher animal numbers than obtained in most of the previous conventional epidemiological studies. Besides, other ailments than trypanosomosis, which accounted for 32% of the disease problems, were attended to.

7. Acknowledgements

The authors wish to acknowledge the farmers for their participation in this study. The authors also wish to thank the Director of the International Trypanotolerance Centre for providing working facilities and the staff of the ITC station in Bansang for their commitment to the clinic and for the data collection.

This work would not have been possible without the financial support of the Belgian Directory General for development Cooperation (DGDC), and the Flemish technical co-operation (VVOB).

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Table 1

Prevalence of trypanosomosis in equines in Central River Division of The Gambia based on reports of Loum and Mbacke; Mattioli *et al*. and Faye *et al*. (1989, 1998 and 2001).

Prevalence of trypanosomosis (%)			
Equines	Donkeys	Horses	Reference
5.5 % (236)			Loum & Mbacke (1989)**
	9.2 % (173)		Mattioli *et al*. (1994)*
17.1% (38)***	6.2% (67)*	45.5% (11)*	Faye *et al*. (2001)

* Pooled data from the districts Niamina East district and Fulladu West district;

** Includes villages from CRD north;

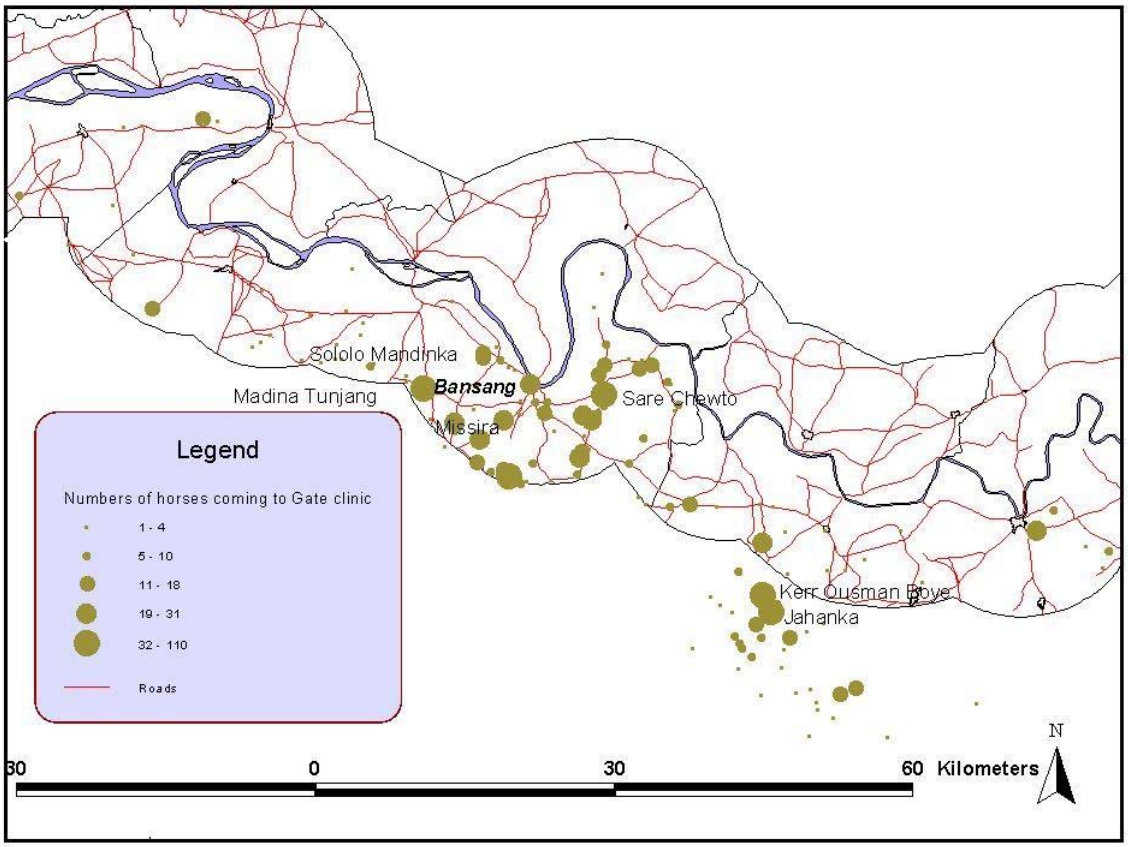
***Data from the Fulladu West district.

Table 2

Trypanosome infections in equines in the Sololo Gate Clinic of Fulladu West district of the Central River Division of The Gambia, between September 1995 and May 2000 and from July 2001 until July 2002.

Species	Total of cases admitted at gate clinic	Total of trypanosome infections (Occurrence %)	% TC	% TV	%TB	% MI	Total of trypanosome infections per gender class (Occurrence %)		Total of trypanosome infections per age class (Occurrence %)	
							Female	Male	< 1 year	> 1 year
Horses	2113	1322 (62.6)	64.0	32.4	0.4	3.2	369 (67.8)	953 (60.7)	84 (54.5)	1238 (63.2)
Donkeys	172	74 (43.0)	70.3	29.7	0	0	24 (46.2)	50 (41.7)	2 (20.0)	72 (44.4)
Equines	2285	1396 (61.1)	64.3	32.2	0.4	3.1	393 (65.9)	1003 (59.4)	86 (52.4)	1310 (61.7)

TC = *T. congolense*, TV = *T. vivax*, TB = *T. brucei* and MI = mixed infections



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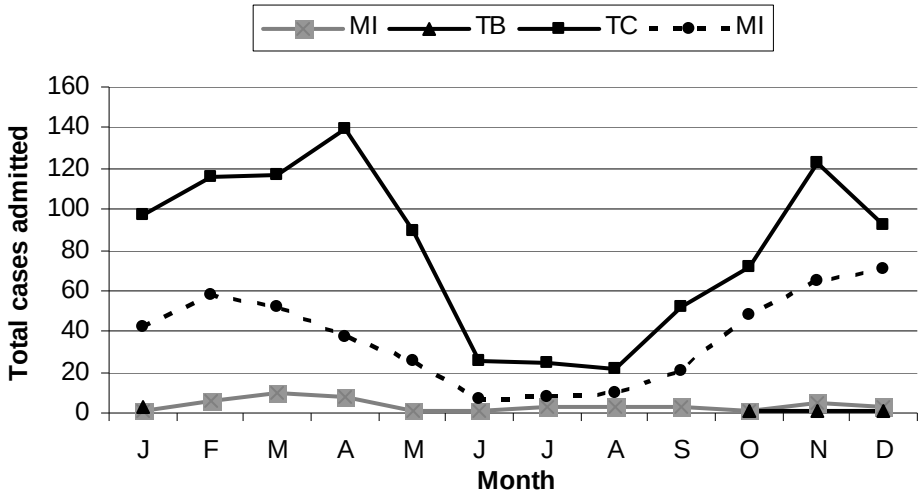
367

368 **Figure 1:** Origin of equines with trypanosome infections admitted at the Sololo gate clinic in the
369 Fulladu West district of the Central River Division of The Gambia, between September 1995 and
370 May 2000 and from July 2001 until July 2002



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372 **Figure 2:** Aggregated monthly occurrence of the different trypanosome species in equines
373 admitted at the Sololo gate clinic in the Fulladu West district of the Central River Division of The
374 Gambia, between September 1995 and May 2000 and from July 2001 until July 2002.

375 TC = *T. congolense*, TV = *T. vivax*, TB = *T. brucei* and MI = mixed infections

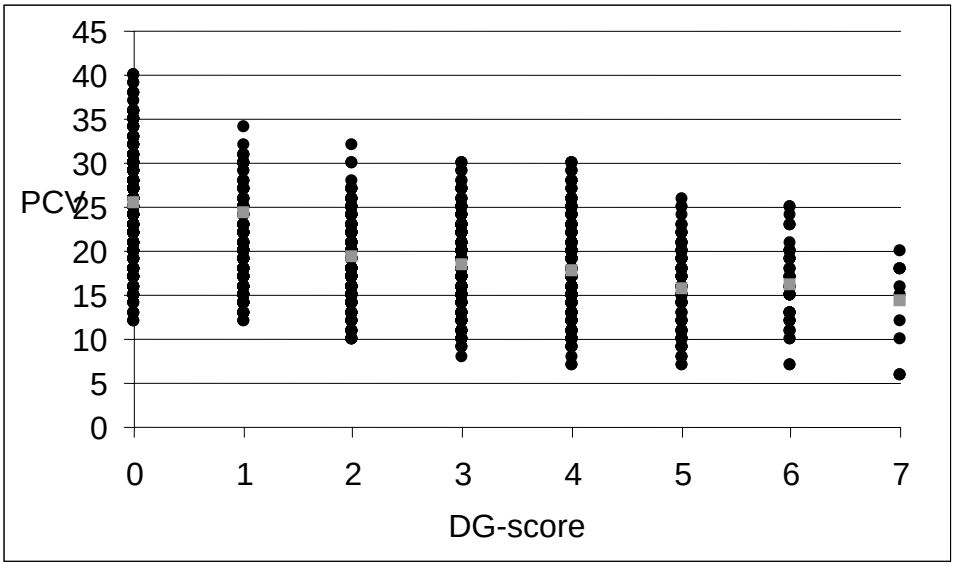

Figure 3: Relationship between Packed Cell Volume and darkground-score in equines admitted at the Sololo gate clinic in the Fulladu West district of the Central River Division of The Gambia, between September 1995 and May 2000 and from July 2001 until July 2002.

Table of figures