

## Haematological studies of donkeys in Sokoto state, Nigeria

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### Abstract

Normal reference values for adult donkeys were established by studying the haematological parameters of 50 donkeys in Sokoto state. The mean values obtained for RBC, WBC, PCV, ESR and  $4.68 \times 10^6 / \text{mm}^3$ ,  $10.17 \times 10^3 / \text{mm}^3$ , 30.28% and 48.46mm/20min respectively. Differential counts were as follows: Neutrophils, 48.84%, Lymphocyte 40.2%, Monocyte 7.12%, Eosinophils 2.54% and Basophils, 1.12%. No significant differences was observed between the sexes in all the parameters ( $P > 0.05$ ). The correlation between the haematological parameters of male, female and all sexes was also not significant ( $p > 0.05$ ).

**Keywords:** Haematology, Donkeys

### Introduction

Haematology in clinical practice is important to the clinician, as are the history and the physical examination of the animal especially in the modern veterinary practice. This is more evident in procedures for the diagnosis of many protozoan infections that are so prevalent in equine and other species of animals Oduye (1976). The results of these procedures are more important, as they may provide absolute evidence regarding physiologic alterations, resulting from a disease (Coles, 1986) Donkeys contribute considerably to the agricultural economy of the third world mainly through their transport role; carrying loads, water and other forms of aids to man, and in other places donkey is used for farming and thus has become a necessity without which life would be very difficult to those people especially of the rural areas, where donkeys stand as a great asset. In Sokoto, donkeys are mainly used for draught power and transport, they are however, managed on semi intensive system.

The reference values for haematological parameters of domestic donkeys, in our tropical African environment have been established: In Egypt (Botros *et al.*, 1970); in Kenya (Maloiy and Boarer, 1971); in Zimbabwe (Hill, 1989) and in Botswana (Mushi, *et al.*, 1999). In Nigeria however, Ikede, *et al.* (1977) came with haematological values of donkeys in his study of

experimentally infected donkeys with *T. brucei*. These values cannot be used as normal reference values for clinical purpose. This study is therefore designed to determine the normal haematological data of apparently healthy donkeys in Sokoto, Nigeria.

### Materials and Methods

Fifty apparently healthy adult donkeys (male and females), were randomly sampled at Sokoto Kara Market (Old market) over a period of 3 weeks. Blood was obtained from each animal by venipuncture using the neck collar for the restraint, to allow for smooth collection. The samples were collected in a commercial sample bottle containing EDTA and analysis was conducted immediately after collection. The percentage PCV were determined using micro-hematocrit method (Coles, 1986; Sastry, 1989; Sirois 1995). The red blood cell (RBC) and white blood cells (WBC) counts were determined using the hemocytometer method. (Benjamin, 1961; Coles, 1986; Satry, 1989; Sirois, 1995). The percentage of individual white cells (differentials white cell counts) were determined on Leishman's stained slides using a microscope at x 100 magnification using meander method (Coles, 1986). Westergren method was used to estimate the erythrocyte sedimentation rate (ESR) (Coles, 1986).

## Results

The mean RBC count was found to be 4.66 with a standard deviation of 1.2. The range of values was from 2.52 to 8.81 x 10<sup>6</sup>/mm<sup>3</sup> (Table 1). The mean value for females was found to be slightly higher than that of males, but this difference was not significant (P<0.05). Also no significant differences observed between the sexes in respect of all the other haematological parameters.

The mean PCV was found to be 30.16% with a standard deviation of 3.18. The range was from 20-37 percent (Table 1). No significant difference (P>0.05) was observed between the sexes.

The mean WBC value was found from 3.1-29.3 percent (Table 1). The mean values of males were also found to be slightly higher than that for females but the difference was not significant (P>0.05).

From table 1 the mean ESR was found to be 48.46 with a standard deviation of 21.96. The range was from 20-140 mm/20min. The mean values for females is slightly higher than that of males, but the difference was also not significant (P>0.05).

The values of differential leukocyte counts were also obtained and the mean value for the neutrophils was found to be 48.84 with a standard deviation of 10.61. The range of values was from 21-70 percent (Table 1). The mean value for male and the differences was found to be not significant (P>0.05). As for the lymphocyte the mean value was found to be 39.2 with a standard deviation of

11.71 and the range of values was from 20-67. The mean value for males was found to be slightly higher than that of females but it is not of significant differences (P>0.05). The mean monocytes value was found to be 7.12 percent with a standard deviation of 3.01. The range of values was from 2-15 (Table 1). The mean value for females was found to be slightly higher than that of males, but it is of no significant difference (P>0.05).

The mean values of eosinophils and basophils were found to be 4.20% and 1.12% respectively with no significant differences between the sexes. The standard deviation for Eosinophils was found to be 2.19 and a range of 0.9 while the standard deviation for basophils was found to be 1.15 and the range of value was found to 0-4.

A positive correlation was found to exist between PCV and WBC of donkeys but this was not significant (P>0.05), whereas the correlation between PCV and RBC was positive and significant (P<0.05). A negative significant correlation was observed (P<0.05) between PCV and ESR of donkeys.

Table 2 shows a negative but significant correlation existing between WBC and ESR of donkeys (P<0.05) while positive correlation exist between RBC and NBC of donkeys. But the significance was negligible (P>0.05). Finally a significant negative correlation was observed between NBC and ESR of donkeys (P<0.05).

Table 1  
Sex comparisons of some haematological parameters in Nigerian donkeys

Variable	Male	Female	All	t-value (male vs. female)
PCV (%)	30.05±3.44 (20 – 37)	30.92±3.25 (25 – 37)	30.28±3.38 (20 – 37)	t=0.05 (P>0.05)
RBC	4.69±1.26 (2.52 – 8.28)	4.63±1.49 (3–8.81)	4.68±1.31 (2.52–8.81)	t = 0.46 (P>0.05)
ESR	49.73±24.25 (20 –104)	44.86±13.67 (22–75)	48.46±21.96 (20–140)	t = 1.13 (P>0.05)
WBC	10.8±4.32 (5.9 – 29.3)	8.38±2.97 (3.1–13.7)	10.17±4.12 (3.1–29.3)	t = 0.22 (P>0.05)
Neutrophils	49.97±10.79 (21 – 70)	51.31±10.08 (40–70)	48.84±10.61 (21–70)	t = 0.89 (P>0.05)
Lymphocytes	39.78±12.5 (20–80)	41.38±18.49 (27–95)	40.2±14.11 (20–95)	t = 0.94 (P>0.05)
Monocytes	7.49±2.98 (2–15)	6.08±2.99 (2–12)	7.12±3.01 (2–15)	t = 0.29 (P>0.05)
Eosinophils	2.73±2.64 (0–9)	2±2.24 (0–6)	2.54±2.54 (0–9)	t = 0.19 (P>0.05)
Basophils	1.11±1.05 (0–4)	1.15±1.46 (0–4)	1.12±1.15 (0–4)	t = 0.36 (P<0.05)

Table 2  
Correlation co-efficient of selected haematological parameters of donkeys in Sokoto, north-western Nigeria

Parameters	Male	Female	All
PCV/RBC	0.3006	0.5023	0.3489
PCV/ESR	-0.3501	0.0342	-0.2951
PCV/WBC	0.2844	-0.0208	0.1894
PCV/Neutrophils	-0.2657	0.0491	-0.1751
PCV/Lymphocytes	0.1779	-0.1256	0.0848
PCV/Mono.	0.1899	0.1809	0.1588
PCV/Eosinophils	-0.2612	0.3206	-0.1510
PCV/Basophils	-0.2097	0.3704	-0.0297
RBC/ESR	-0.0957	-0.2426	-0.1149
RBC/WBC	0.5152	0.1000	0.3891
RBC/Neutrophils	-0.1591	0.1332	-0.0820
RBC/Lymphocytes	0.1150	0.0020	0.0718
RBC/Monocytes	-0.0312	-0.2512	-0.0869
RBC/Eosinophils	-0.4606	0.2598	-0.2724
RBC/Basophils	-0.3372	0.2246	-0.1602
ESR/WBC	-0.1335	0.4278	-0.0408
ESR/ Neutrophils	0.1715	0.2611	0.1656
ESR/Lymphocytes	-0.3007	-0.2599	-0.2730
ESR/Monocytes	0.2276	0.5556	0.2866
ESR/Eosinophils	-0.0770	0.2194	-0.0230
ESR/Basophils	0.0517	0.4789	0.1289
WBC/Neutrophils	0.0214	0.3162	0.0336
WBC/Lymphocytes	-0.0550	0.3532	0.0312
WBC/Monocytes	0.1454	-0.1173	0.1438
WBC/Eosinophils	-0.4255	-0.4325	-0.3745
WBC/Basophils	-0.1633	-0.0492	-0.1296
Neutrophils/Lymphocytes	-0.7832	-0.4045	-0.6348
Neutrophils/Monocytes	-0.1613	-0.3333	-0.2247
Neutrophils/Eosinophils	0.0251	-0.1294	-0.0247
Neutrophils/Basophils	-0.1078	-0.1000	-0.1001
Lymphocytes/Monocytes	-0.0859	-0.4263	-0.2012
Lymphocytes/Eosinophils	-0.2356	-0.3124	-0.2541
Lymphocytes/Basophils	0.0061	-0.1872	-0.0717
Monocytes/Eosinophils	0.1160	0.5369	0.2285
Monocytes/Eosinophils	0.0361	0.3405	0.1248
Monocytes/Basophils.	0.5323	0.5858	0.5271
Eosinophils/Basophils	1	1	1

## Discussion

However, the results of this work shows lower values with a wide range in all the parameters examine as compared to the work reported by Schalm *et al.* (1975); who observed higher values of the parameters with a short range and attributed this to such factors as climate, age, health status time of the day, transportation, excitement and other related factors, affecting an increase or decrease in the values of RBC, PCV, WBC, ESR and Differential leukocytes count.

No significant sex difference was established for the RBC count in the present work this agrees with the previous work conducted on sheep (Oduye, 1976) horses, (Schalm, *et al.*, 1975) and donkeys

(Nayeri, 1975). In the present work the RBC count has a range of 2.52-8.81 million, which is wider than those obtained in donkeys and burro 6.4-7.1 million, and mule 7.5-8.0 million (Schalm *et al.*, 1975). This wide range probably occurs due to either physiological or environmental factors also the nutritional status, breed, blood volume and other physical activities.

The result of this work shows equal percentage of PCV values of male and female donkeys indicating no sex differences, which confirms the previous work conducted on donkeys (Schalm *et al.*, 1975; Gupta *et al.*, 1992; Nayeri, 1978), so also in cattle (Oduye and Kunaiya, 1971; Olusanya and Adepoju, 1979) and sheep and goat (Oduye, 1976).

However, it was found in this study the PCV range of 20-37 percent with a mean of 30.28 percent, this is lower than the values of most species of domestic animals which fall between 38-45 percent with a mean of 40 percent as reported by Schalm *et al.* (1975) and Swenson (1990). Nutritional status, excitement, time of the day, environmental temperature, altitude and other climatic factors can lead to these great differences.

The values obtained for the ESR in this work cannot easily be related to those values obtained previously in different species of domestic animals. This is because the ESR value varies greatly among different species of animal and also among individual, of the same specie. However, in this work the speed with which the cells settled within 20 minutes was very high, though a rapid ESR may be present when normal haemoglobin and PCV are present. However, there is but a slight sex differences in the values obtained for the male or female donkeys which is not significant. This is contrary to what Schalm *et al.* (1975) has reported.

The total leukocyte in this work was found to be 3.1 to 29.3 thousand per cubic millimetre with a mean of 10.8 thousand per cubic millimetre. This does not tally with 12,600 to 14,400/dl WBC count in donkeys as reported by Schalm *et al.* (1975). A decrease or increases are markedly influence by age which in this study was not determined and also physiological activity of the animal. No significant sex difference was observed.

The differential leukocyte counts obtained in this work for both male and female donkeys' shows no significant sex differences. However, in this work the value of neutrophils was found to out numbered the lymphocytes values, which the reverse is the case as reported by Schalm *et al.* (1975) in which the number of lymphocyte out numbered the values of neutrophils. In this work the values obtained for neutrophils was 21-70 percent with and mean of 48.84 percent there is very little sex differences, which is not significant. While Schalm *et al.* (1975) reported the lymphocyte to neutrophils ratio to be 3.5 in donkeys. The explanation for the increase number of neutrophils can be attributed to the health status of the animals especially in bacterial disease in which neutrophilic production is regulated by a colony stimulating factor produced by bone marrow macrophages, as a result of bacterial products in infections (Sastry, 1989). However, the values of neutrophils and lymphocytes donkeys obtained in this work are in line with those found in horses (Hansen and Todd, 1951). However, increase in the fibrinogen content of the plasma hastens agglutination and settling while other workers reported increase in globulin to have influenced in rapid ESR.

## Conclusions

The present work has attempted to establish a reference values for haematological interpretations of donkeys in Sokoto State. However, due to certain difficulties encountered during the work as per laboratory equipments and the limitations of examining the sampling animals; only sex was considered. It is therefore recommended that subsequent work should be conducted in line with age, breed, season, etc.

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