

Original Research Article

Studies on haematological parameters in horses located in Port Harcourt Nigeria

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Abstract

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This study was conducted to determine the baseline data of haematological parameters of horses in Port Harcourt, Nigeria. Blood samples were collected from 72 apparently healthy horses comprising 22 females and 50 males. The horses sampled were both local and exotic breeds aged between 5 months and 13 years. Mean haematological parameters including packed cell volume, erythrocyte count, haemoglobin concentration, mean corpuscular volume, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration, total and differential leucocyte counts were determined by standard methods. Values recorded were comparable to normal values of horses in other parts of world. There were no significant difference between the mean haematological values recorded in different breeds, sex and age. In conclusion, the generated data may serve as reference values for horses in Nigeria in order to evaluate their health conditions.

Keywords: Apparently healthy, Haematological parameters, Horses, Reference values

INTRODUCTION

In Nigeria, horses are kept by Research institutes, security agencies for parade and crowd control, Emirs and Local Chiefs for ceremonies, and some elites for racing, polo games and pleasure riding (Zettl, 2007). Evaluating the hematological parameters of horses regarding age, gender and breeds are crucial for assessing the health and fitness levels of horses (Fazio *et al.*, 2011). It has been reported that sex, age and breed influence haematological parameters (Oyewale and Durotoye, 1988). A healthy horse maintains a concentration of red and white blood cells, and other blood components within an established 'normal' range relative to its age, sex, breed, degree of fitness, health and nutritional adequacy (Kohnke, 2009). Deviations from the normal range, either above or below the limits of this range, in one or more blood components, can signify an underlying disease process or a lack of response to exercise by a horse in work.

This study was aimed to establish baseline data of haematological parameters in apparently healthy horses located in Port Harcourt, Nigeria.

MATERIALS AND METHODS

The study was conducted in Port Harcourt polo club, Rivers State, Nigeria, situated in 40° 45' N, 7° 00' E. The horses were housed in standard stables (measuring 10 m x 12m), made of concrete floor, cement block wall and asbestos roof and well ventilated. The horses were fed wheat bran, sorghum, hay and fresh pasture. Seventy two horses were sampled, consisting of 22 females and 50 males. The horses were grouped as young horse (0 – 4years) and adult horses (5 -13 years) Dental eruption; wear and Galvayne's groove appearance pattern was used to estimate their ages as described by Wayne and Melvin (2000). They were pre-conditioned for two weeks

Table 1. Haematological values of apparently healthy horses in Port Harcourt, Nigeria

Parameters (Units)	Mean \pm SD (n=72)	Range	Normal Range*
Packed Cell Volume (PCV) %	35.82 \pm 6.77	24 -53	32 -53
Haemoglobin (Hb) concentration (g/dl)	11.98 \pm 2.21	8.0 - 17.6	11.0 -19.0
Red Blood Cell (RBC) count ($\times 10^6/\mu\text{l}$)	6.65 \pm 0.85	4.54 - 8.24	6.8 - 12.9
Mean Corpuscular Volume (MCV) (fl)	58.08 \pm 0.85	39.1 - 94.0	37 - 58.5
Mean Corpuscular Haemoglobin (MCH) (pg)	18.13 \pm 2.93	13.1 - 31.1	12.3 -19.7
Mean Corpuscular Haemoglobin Conc (MCHC) (g/dl)	33.5 \pm 0.56	32.0 -35.0	31.0 -38.6
White Blood Cell count (WBC) ($\times 10^9/L$)	7.03 \pm 1.56	4.25 - 12.9	5.4 - 14.3
Absolute Differential Leucocyte Counts ($\times 10^9/L$)			
Segmented Neutrophil count	3.5 \pm 1.13	1.79 -7.08	2.3 - 8.5
Banded Neutrophil count	0.19 \pm 0.13	0 - 0.55	0 - 0.1
Lymphocyte count	2.29 \pm 0.82	0.9 - 5.68	1.5 - 7.7
Eosinophil count	0.16 \pm 0.15	0 - 0.77	0 - 1.0
Monocyte count	0.49 \pm 0.21	0.51 - 1.02	0 - 1.0
Basophil count	0.01 \pm 0.03	0 - 0.13	0 - 0.3

Kaneko (1997).

Table 2. Effect of Breed on Haematological Values of Horses Sampled

Parameters	Breeds		P -value
	Local (n = 42)	Exotic (n = 30)	
Packed Cell Volume (PCV) (%)	36.19 \pm 7.69	35.30 \pm 5.29	0.221
Haemoglobin concentration (g/dl)	12.09 \pm 2.51	11.82 \pm 1.69	0.223
Red Blood Cell (RBC) Count ($\times 10^6/\mu\text{L}$)	6.63 \pm 0.85	6.68 \pm 0.87	0.561
Mean Corpuscular Volume (MCV) (fL)	54.71 \pm 9.94	53.19 \pm 7.20	0.587
Mean Corpuscular Haemoglobin (MCH) (Pg)	18.33 \pm 3.30	17.85 \pm 2.39	0.570
Mean Corpuscular Haemoglobin Concentration (MCHC) (g/dl)	33.49 \pm 0.53	33.56 \pm 0.59	0.213
White Blood Cell (WBC) Count ($\times 10^9/L$)	6.60 \pm 1.17	7.63 \pm 1.84	0.392
Absolute Differential Leucocyte Counts ($\times 10^9/L$)			
Segmented Neutrophil Count	3.31 \pm 0.79	3.78 \pm 1.26	0.368
Band Neutrophil Count	0.71 \pm 0.13	0.22 \pm 0.13	0.542
Lymphocyte Count	2.53 \pm 0.81	2.92 \pm 0.79	0.479
Monocyte Count	0.45 \pm 0.18	0.54 \pm 0.23	0.412
Eosinophil Count	0.12 \pm 0.10	0.21 \pm 0.20	0.455
Basophil Count	0.01 \pm 0.03	0	0.530

before the commencement of the sampling; during this period, all the horses were screened and treated for endo-and haemoparasites.

Collection of Blood Sample

3ml of blood was collected from each horse through a jugular venipuncture with disposable sterile syringe and 18G needle into plastic sample bottle containing 1mg ethylenediaminetetra acetic acid (EDTA), and then used for haematological evaluation.

Haematological Analysis

The collected blood was used to determine packed cell volume, erythrocyte count, haemoglobin concentration,

and total and differential white blood cell counts by methods described by Cole (1986).

Data Analysis

The data obtained were expressed as means \pm standard deviations (M \pm SD). The relationship between values of male and female horses, age and breed of horse was assessed using Student's *t*-test, and values of $p < 0.05$ were considered statistically significant.

RESULTS

The mean (\pm SD) and range of the haematological parameters obtained in this study were presented in table

Table 3. Haematological parameters of horses in Port Harcourt in relation to gender

Parameters	Male (n = 50)	Female (n = 22)	P – Value
Packed Cell Volume (PCV) (%)	36 ± 6.7	35.41 ± 7.06	0.951
Haemoglobin concentration (g/dl)	12.03 ± 2.19	11.85 ± 2.29	0.577
Red Blood Cell (RBC) Count (x 10 ⁶ /μL)	6.69 ± 0.89	6.61 ± 0.84	0.540
Mean Corpuscular Volume (MCV) (fL)	54.30 ± 9.38	53.56 ± 7.87	0.380
Mean Corpuscular Haemoglobin (MCH) (Pg)	18.20 ± 3.10	17.98 ± 2.59	0.496
Mean Corpuscular Haemoglobin Concentration (MCHC) (g/dl)	33.5 ± 0.54	33.55 ± 0.59	0.781
White Blood Cell (WBC) Count (x 10 ⁹ /L)	7.11 ± 1.79	6.86 ± 0.87	0.686
Absolute Differential Leucocyte Counts (x 10⁹/L)			
Segmented Neutrophil Count	3.56 ± 1.14	3.39 ± 0.76	0.460
Band Neutrophil Count	0.20 ± 0.15	0.17 ± 0.10	0.542
Lymphocyte Count	2.69 ± 0.87	2.71 ± 0.70	0.411
Monocyte Count	0.51 ± 0.22	0.44 ± 0.15	0.422
Eosinophil Count	0.16 ± 0.18	0.15 ± 0.10	0.297
Basophil Count	0.01 ± 0.03	0.01 ± 0.03	0.606

Table 4. Mean (± SD) haematological values of horses sampled in relation to age

Parameters	Young (n =24)	Adult (n = 48)	P-Value
Packed Cell Volume (PCV) (%)	33.58 ± 6.21	36.94 ± 6.82	0.195
Haemoglobin (Hb) Concentration (g/dl)	11.98 ± 2.01	12.33 ± 2.33	0.188
Red Blood Cell (RBC) Count (x 10 ⁶ /μL)	6.54 ± 0.84	6.71 ± 0.86	0.415
Mean Corpuscular Volume (MCV) (fL)	51.53 ± 7.24	55.35 ± 9.41	0.320
Mean Corpuscular Haemoglobin (MCH) (Pg)	17.36 ± 2.47	18.52 ± 3.10	0.340
Mean Corpuscular Haemoglobin Concentration (MCHC) (g/dl)	33.66 ± 0.72	33.45 ± 0.44	0.285
White Blood Cell (WBC) Count (x 10 ⁹ /L)	7.51 ± 1.95	6.79 ± 1.29	0.395
Absolute Differential Leucocyte Counts (x 10⁹/L)			
Segmented Neutrophil Count	3.60 ± 1.13	3.46 ± 0.99	0.286
Band Neutrophil Count	0.22 ± 0.16	0.18 ± 0.12	0.519
Lymphocyte Count	2.96 ± 0.96	2.56 ± 0.72	0.411
Monocyte Count	0.55 ± 0.21	0.46 ± 0.20	0.494
Eosinophil Count	0.21 ± 0.18	0.13 ± 0.13	0.391
Basophil Count	0	0.01 ± 0.03	0.600

1. The mean Hb and PCV were within the normal range but lower limits of the PCV and Hb which were 24% and 8.0 g/dl were below 32% and 11.0 g/dl for normal value (Table 1). The lower limit of the mean RBC count (4.54 x 10⁶/μL) was lower than 6.8 x 10⁶/μL of the normal range (Table 1). The mean MCV, MCH, and MCHC were within the normal range while the upper limit of MCV (94 fL) and MCH (31.1 pg) were higher than 59 fL and 19.7 pg respectively of the normal range (Table 1).

The mean WBC count was within the normal range but the lower limit (4.25 x 10⁹/L) was below 5.4 x 10⁹/L of the normal range (Table 1). The mean segmented neutrophil count fell within the normal range but the lower limit (1.79 x 10⁹/L) was less than 2.3 x 10⁹/L of the normal range (Table 1). The mean of the banded neutrophil count (0.19 x 10⁹/L) was above the normal range values of 0 – 0.1 x 10⁹/L, similarly the upper limit (0.55 x 10⁹/L) was higher than

0.1 x 10⁹/L of the normal range (Table 1). The mean lymphocyte, monocyte, eosinophil and basophil counts did not differ from the normal values. The lower limit (0.90 x 10⁹/L) of the lymphocyte count was below 1.5 x 10⁹/L of the normal range while the upper limit (1.02 x 10⁹/L) of monocyte count was higher than 1.0 x 10⁹/L of the normal range (Table 1).

Values of mean haematological parameters of local and exotic breeds did not differ significantly. However, values of PCV, Hb, MCV and MCH were slightly higher in the local breeds than exotic breeds while the values of total WBC, segmented neutrophil, lymphocyte, eosinophil and monocyte counts were slightly higher in the exotic horses than the local horses (Table 2). Values of PCV, RBC, Hb, MCH, MCV, total WBC, neutrophil, monocyte and eosinophil counts were higher in male horses than female horses (Table 3). The PCV, Hb, RBC, MCV, MCH were slightly higher in

the adult horses while the total WBC, neutrophil, lymphocyte, monocyte and eosinophil counts were higher in the young horses than adult horses (Table 4).

DISCUSSION

The results of the present study demonstrated that the mean PCV and Hb and RBC values did not differ from the normal values reported by in other horses from different parts of the world (Schalm *et al.*, 1975). This agrees with the previous work done by Egbe-Nwiyi *et al.* (2012) and Ihedioha and Agina (2013) who observed similar results. The mean MCV, MCH and MCHC values observed in the present study were also in agreement with the findings of previous workers (Kaneko, 1997). Red blood cell count, haemoglobin level and haematocrit (PCV) are used to detect anaemia, whereas other red cell values such as MCHC and MCV can help to diagnose the cause (Schalm and Carlson, 1982).

Minor haematological differences between females and males have been reported (Jain, 1986) Males have slightly higher RBC, HB and PCV, while females have higher MCH and MCHC (Satué *et al.*, 2009). Persson and Ullberg (1974) had reported that baseline haematologic values were higher in stallions than in mares and geldings, this may be due to the effect of androgens on erythropoiesis. It has been reported that mares and geldings showed a hypokinetic circulation with increased oxygen uptake by active muscle during exercise (Persson and Ullberg, 1974).

The white blood cells (WBC) and the absolute differential leucocyte counts namely; neutrophils, eosinophils, lymphocytes, monocyte and basophil values were in consonance with earlier reports (Egbe-Nwiyi *et al.*, 2012). Leucocytes generally participate in body defense against invading bacteria, viral and parasitic organisms but each is kinetically and functionally independent (Duncan and Prasse, 1977; Coles, 1980). The slight differences in terms of lower or upper limits of values recorded in this study when compared with the normal values may be attributed to environmental, nutritional factors and disease (Jain, 1986).

Conflict of Interest

The authors do not have any conflict of interest.

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CONCLUSION

The result of the haematological parameters evaluated in the horses fell within the normal range recorded in horses elsewhere in the world. The generated data may serve as reference values for horses in Nigeria in order to evaluate their health status.

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