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HEAMATOLOGICAL PARAMETERS OF ONE HUMP CAMELS (*Camelusdromedarius*) IN NORTH WESTERN NIGERIA

Ibrahim, H. M.,[1] Bulama, I.,[2] Bashir, S.,[1]Abubakar,S. I.[3] and Ali, W.[4]

1 Department of Veterinary Physiology and Biochemistry Faculty of Veterinary Medicine Usman Danfodiyu University Sokoto Sokoto State Nigeria

2 Department of Veterinary Physiology and Biochemistry Faculty of Veterinary Medicine University of Maiduguri, Borno State Nigeria

3 Veterinary clinic Ministry of Animal and Fishery Sokoto Sokoto state Nigeria

4 Department of Veterinary Pathology Faculty of Veterinary Medicine University of Maiduguri Borno State Nigeria

ABSTRACT

Camels are regarded as the ship of the desert, being used for transporting humans and their goods. They are also raised for milk, meat, hides and wool. Normal haematological values are important as disease diagnostic aid as they are vital indicator of the animals' health status. Haematological parameters of one- humped camels (Camelusdromedarius) were determined in this study. 60 one- humped camels (Camelusdromedarius) were selected in sokoto and their blood samples were analyze using standard procedures for haematological parameters[Packed cell volume (PCV), red blood cells (RBC), haemoglobin (Hb),white blood cells (WBC), neutrophils, eosinophils, Basophils, monocyte, lymphocyte, mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), and mean corpuscular haemoglobin concentration (MCHC)].For all the parameters, only neutrophils and MCV values showed significant variation between sexeswith male camels having higher values than females. There is variation in the range values for all the parameters between sexes except Basophils, Monocyte and Lymphocyte. Base on the results of this study, the values were similar in both sex except in neutrophils and mean corpuscular volume indicating insignificant effect of sex on most of the haematological parameters.

INTRODUCTION

Camels are regarded as the ship of the desert, being used for transporting humans and their goods. They are also raised for milk, meat, hides and wool. In Nigeria, the development is a growing increase in their contribution to human protein supply (Wilson, 1984; Zakari *et al.,* 1988). They are important player in the food security of the nomadic pastoralist (El-Naya & Barghash, 2016) and in the economy of northern Nigeria (FDLPCS, 1992). They have high working capacity and add value to environmental preservation (Chafe *et al.,* 2003). Phenotypic features of the camels are influenced by geographical locations (Yahaya *et al*. 2012). They are genetically diverse with varied colour phenotype within the gene pool (Abdussamad *et al*. 2015), but breed definitions are unavailable within the camel population in the country (Waziri *et al*., 2019). The national camel population has been estimated to be 90,000 (Bourn *et al.* 1994) and are mostly found in Borno, Jigawa, Kano, Kastina, Kebbi, Sokoto, Yobe and Zamfara States where they are reared as sedentary or pastoral herds (Jaji*et al*. 2017).In recent times there has been a sound increase in the number of camels slaughtered for meat in Sokoto and other cities in the region due to increasing cost of cattle and the decline in number of other livestock species. Daily 16-25 camels are being slaughtered at the Sokoto metropolitan abattoir (MANR, 2002). Camels are hardy animals that have a strong adaptation to the harsh weather conditions of arid regions because of their unique physiological characteristics (Karimi *et al.,* 2014). Despite their role as a member of the food producing family of livestock, camels have for a long time remained the most neglected animal in the field of scientific research.

Haematology is becoming an increasingly important diagnostic and management tool in veterinary medicine, globally (Tharwat *et al*., 2015).

The blood picture of an animal provides an opportunity to clinically investigate the presence of different metabolites and other constituents in the body of the animal and it plays a vital role in the assessment of physiological, nutritional and pathological status of an animal (Ghoneim *et al*. 2014;Doyle, 2006). It also helps in distinguishing the normal state from the state of stress, which can be nutritional, environmental or physical (Aderemi, 2004). In order to interpret the results obtained in the laboratory, comparison with normal reference values of clinically healthy animals has to be made which serve as an index to the clinician. Unsuitable reference values may lead to further investigations or wrong diagnosis (Tsang *et al.,*1998).

It is not recommended to use haematological values reported from different environments and conditions as reference values in our local breed of animals since geographical variations in haematological values exist (Ezeilo, 1972; Gul *et al.,* 2007). Such variations are attributed to environmental factors especially dietary habits (Ezeilo, 1972; Enyikwola and Ghoshal 1989) and other factors such as species, breed, sex, age, nutrition, illness, stress, exercise, transport, and season (Jain, 1998). The haematological parameters reported for dromedarycamelsin northern Nigeria (Fatihu *et al*. 2000; Kamalu *et al*. 2003) seemed to partially fit into the previously reported reference values from different global locations (Al-Haj, 2013; Vap and Andrea, 2014; Farooq *et al*., 2011). Because the available data is inconsistent, having a wide range of values, which are in disagreement with each other. Values reported as normal reference were obtained on relatively small and undefined groups of animals with no reference to age, sex and environmental condition. This study was therefore aimed to evaluate the haematological parameters of the one-humped camels in Nigeria.

MATERIALS AND METHODS

Study location

The study location is Sokoto south local government, Sokoto state in north-west Nigeria. This state shares border with Zamfara and Kebbi state, and Federal Republic of Niger. It covers a total land area of 101, 735 km^2 with an estimated human population of 3,702,676 (NPC, 2006).

Animals for study

The study population was 60 apparently healthy camels presented for slaughter (32 males and 28 females) to the abattoir and the sex of each sampled animal were observed and recorded appropriately.

Blood sample collection

Blood samples for the haematological analysis were collected from the jugular vein into labelled sample bottle containing ethylene diaminetetracetic acid (EDTA). The samples were then transported on ice to the veterinary physiology laboratory in the department of Veterinary Physiology and Biochemistry UsmanDanfodiyo University Sokoto for haematological analysis.

Haematological analysis

The blood samples were analyzed using the following methods; the packed cell volume (PCV) was measured using the microhaematocrit method (Brar *et al*., 2000). The red blood cells (RBC) count and white blood cells (WBC) count were done with a haemocytometer (Brar*et al* ., 2000), the differential leukocyte counts was performed on thin smear stained with Leishman stain (Coles, 1986). The haemoglobin (Hb) concentration was determined by the cyanomethaemoglobin method. The mean corpuscular volume (MCV), the mean corpuscular haemoglobin (MCH) and the mean corpuscular haemoglobin concentration (MCHC) are determined using standard formula (Coles, 1986).

RESULTS

For all the 60 camels (32 males and 28 females) examined, the mean PCV value for females is found to be higher than that of the males although not statistically significant ($p>0.05$) (Table 1).The mean RBC count for females was found to be higher than that of males also with no significant difference ($p>0.05$) (Table 1). Both sexes have same upper and lower limit (Table 1).Male camels was found to have higher mean WBC count than their female counterpart though not statistically significant ($p>0.05$) (Table 2).

From Table 1, mean haemoglobin concentration for females is higher than that of the males also with no statistically significant($p>0.05$)difference (Table 1)but males have wider range than females

The values for differential leucocytes count indicated that the mean eosinophils and neutrophils were higher in males while the mean basophils values is higher in females but only variation in neutrophils is significantly($p<0.05$) different (Table 2).

The mean MCV value for males is significantly ($p<0.05$) higher than that of females while the mean MCH and MCHC were insignificantly higherin female camels (Table 1).

Table 1:Mean ± SD and Range of the Haematological Erythrocytic valuesof *Camelusdromedarius*

Parameter		Range	Mean± SD	Level of significance (P- value)
PCV (%)	All	19-45	27.95±7.11	
	Males	19-45	27.41±7.24	p>(0.05)
	Females	20-44	28.57±6.91	
RBC ($\times10^6$ cells/mm^3)	All	4.00-13.05	6.62±2.42	
	Males	4.00-13.00	6.21±2.45	p>(0.05)
	Females	4.11-13.05	7.09±2.45	
Haemoglobin concentration (g/dL)	All	7.27-16.35	11.00±2.57	
	Males	6.89-16.22	10.62±2.53	p>(0.05)
	Females	7.27-16.35	11.44±2.37	
MCV (fL)	All	29.61-65.78	43.95±7.35	
	Males	33.47-65.78	46.13±7.72	P<(0.05)*
	Females	29.61-47.35	41.47±6.00	
MCH (pg)	All	8.58-37.81	18.28±6.98	
	Males	8.58-37.81	18.88±7.35	p>(0.05)
	Females	9.08-37.47	17.60±6.47	
MCHC (g/dL)	All	24.32-81.50	41.75±15.11	
	Males	24.32-81.18	41.07±15.41	p>(0.05)
	Females	25.13-81.50	42.56±14.73	

Key: P-values with asterisk shows that there is significant statistical variation in the mean obtained between males and females, PCV= packed cell volume, RBC= red blood cells count, MCV= mean corpuscular volume, MCH= mean corpuscular haemoglobin, MCHC= mean corpuscular haemoglobin concentration

Table 2: Mean ± SD and Range of the Haematological Leucocytic values of *Camelusdromedarius*

Parameter	Sex	Range	Mean± SD	Level of significance (P- value)
WBC ($\times10^6$ cells/$mm^{3)}$	All	6.20-22.75	13.45±4.20	p>(0.05)
	Males	7.09-22.75	13.96±3.94	
	Females	6.20-21.35	12.94±4.57	
Lymphocytes (%)	All	30-59	48.05±5.99	
	Males	30-58	48.37±6.02	p>(0.05)
	Females	32-59	47.68±6.15	
Neutrophils (%)	All	18-43	31.28±6.99	
	Males	20-41	33.03±5.92	P<(0.05)*
	Females	18-43	29.28±7.78	
Eosinophils (%)	All	2-10	6.43±2.32	
	Males	3-10	6.81±2.42	p>(0.05)
	Females	2-9	6.00±2.19	
Basophils (%)	All	0-1	0.33±0.47	
	Males	0-1	0.31±0.47	p>(0.05)
	Females	0-1	0.36±0.48	
Monocytes (%)	All	7-10	8.47±1.26	
	Males	7-10	8.47±1.43	p>(0.05)
	Females	7-10	8.46±1.07	

Key: P-values with asterisk shows that there is significant statistical variation in the mean obtained between males and females, WBC= white blood cells count

DISCUSSION

The purpose of this study was to determine the normal haematological parameters of one humped camel (*Camelusdromedarius)* with sex difference in Sokoto northwest Nigeria. The results for all the animals showed wide range of PCV (19-45%) with mean value of 27.97%.This is similar with the report of Fatihu *et al.,*(2000) who reported the normal meanpcv to be 27.94% but Bogin, (2000) reported a higher mean PCV value of 30% while Kamalu *et al.,* (2003) reported slightly higher value of 28.79%.

The range obtained in this study is higher than that reported by Kamalu *et al.,* (2003)(20-40.5%) and Bogin, (2000) (24-35%). Vapand Andre(2014) reported normal range of PCV as 27-45 which has upper limit in agreement with this study. However sex was observed to have no statistically significant (P>0.05) effect on PCV though the mean value (7.24%) in female camels is higher than that obtained in males (6.91%). Farooq*et al.,* (2011) also reported higher PCV values in female. But Anwar *et al*., (2019) reported significantly higher PCV value in female camels. These differences could have physiological basis as variations in such parameters may be associated with the varied levels of responses to the effects of catecholamine and glucocorticoid released during environmental stress, trekking and handling (Tornquist, 2010). Adah *et al*., (2017) reported that trekking and loaded camels, with associated stress, had some increases in PCV and TLC.

The mean value of RBC obtained in this study was 6.62×10^6 cell/mm^3 with range of 4.00-13.05×10^6cell/mm^3. The mean value obtained is lower than the mean(8.9×10^6 cell/mm^3)obtained by Al-Haj, (2013) and (7.6×10^6cell/mm^3) by Bogin (2000). The range obtained in this report is in agreement with that reported by Kamalu *et al.,* (2003) while Bogin, (2000) reported narrow range of 6-9.2×10^6cell/mm^3. Comparison between sex shows no statistically significant (P>0.05)difference but RBC value (7.09×10^6cell/mm^3) in female camels is slightly higher than that obtained in males (6.21×10^6cell/mm^3). This is in agreement with the work reported by Farooq *et al.,*(2011) on one humped camels in which females were reported to have slightly higher RBC values than the males.

The mean total leucocyte count (WBC) in this work was found to be 13.45 $\times10^3$cell/$mm^3$with the range of 6.20-22.75×10^3cell/mm^3. This is in agreement with the report of Bogin, (2000) but Fatihu *et al.* (2000) reported slightly higher(15.18×10^3cell/mm^3) values than the result of this study. While Kamalu *et al.,* (2003) and Al-Haj, (2013) reported 25.6×10^3cell/mm^3 and 10.7×10^3cell/mm^3 respectively which are not in agreement with what is obtained in this study. However, there is no statistically significant difference between WBC of males and that of the females camels (P>0.05). This supports the work of Farooq *et al.* (2011), Which observed that the mean total leucocytes count to be similar in males and females. The predominant white cell is the lymphocyte followed by neutrophils, few monocyte and eosinophils and rare basophils. This supports the leucocyte count reported by Khalid, (2007) in different breeds of camel in Saudi Arabia. However, Jirimutu and Guohui, (2012) reported neutrophils as the predominant leucocyte in Bactrian (two-hump camel). The difference could be associated with breed difference or stress condition. Usually, during stress or excitement, epinephrinemediated physiological leukocytosis causes both neutrophilia and lymphocytosis when there is a balance in leukocyte responses; but leukocytosis, inastressleukogram induced by glucocorticoids, is duetomatureneutrophilia and lymphopenia, and it makes the neutrophil count to increase while the lymphocyte count decreases (Waziri *et al*., 2019).

The mean relative neutrophils of 31.28% with range of 18-43% in this study is much lower than the 50% obtained byBogin, (2000) but higher than the 25.16% reported by kamalu *et al.,* (2003).While the range by Bogin. (2000) of20-40.9% is slightly lower than the result of this study. According to this study, there is statistically significant ($p < 0.05$) difference between number of neutrophils in males and females with mean value of 29.28% in females and 33.03% in males. Similar results was reported by Anwar *et al*., (2019) but Farooq *et al.* (2011) reported no significant variation with sex.

The mean relative lymphocytes value in this study (48.05%) (Range = 30-59%) is higher thanthe value (41%) reported by Bogin, (2000) & (45.00%) by Kamalu *et al.* (2003). And according to this study, there is no statistically significant difference between the mean lymphocytes in males and females.

The mean eosinophil in this study 6.43% is similar to that of Kamalu *et al.,* (2003) who reported the mean value of 6.85.While the result by Bogin, (2000) is 3% which falls within the range obtained in this study. No significant difference was observed between males and females values.

The mean monocyte (8.47%) in this study was found to be higher than that (4%) reported by Bogin., (2000) and lower than that (12.56%) of kamalu *et al.,* (2003).While the range (7-28%)obtained by Kamalu *et al.,* (2003) has high upper limit than the range (7-10%) in this study.

The mean basophil in this study was found to be 0.33% with range of 0-1%. Vap and Andre (2014),also reported mean value of <1% while Kamalu *et al.,* (2003) reported a high mean value of 5.06% and Bogin, (2000) obtained similar range (1%) value. The range (0-1%) for males and females is same as reported by Farooq *et al.* (2011).

The mean haemoglobin concentration obtained in this study is 11.00g/dl with a range of 7.27-16.35.Bogin, (2000) and Fatihu *et al*.(2000) also reported same value of mean haemoglobin concentration, while Al-Haj, (2013) and kamalu *et al.,* (2003) reported the mean as 12.1g/dl and 12.04g/dl respectively which are slightly above the mean in this study. The result also showed that haemoglobin concentration in females is slightly higher than that in males which is contrary to the report of Farooq *et al.* (2011) which showed that the haemoglobin concentration in males is slightly higher than that of females. Significant effect of sex on Hb concentration was observed by Anwar *et al*., (2019) with females having higher values than male camels

The mean for mean corpuscular haemoglobin MCH and mean corpuscular haemoglobin concentration MCHC did not vary significantly between males and females but significant variation with sex was observed in mean corpuscular volume MCV with males having higher value than females.

CONCLUSION

Base on the results of this study, sex was found to have significant effect on neutrophils and mean corpuscular volume which could be as a result of hormonal influence. Also some of the haematological parameters obtained in this study were found to vary from values obtained from other studies conducted in camels which could be due to difference in geographical location, weather, season, type of feed, husbandry or assay method

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